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"SALES AND WANTS."

"Business" (*Continued from page x.*)

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SMOKE RINGS

WITH the interest that has been aroused in models of all kinds by the activities of THE MODEL ENGINEER during the past thirty years, one might imagine that the country has been thoroughly combed through and all existing old-time models brought to light. I do not think this to be the case, and although perhaps discoveries of genuine old-timers are not now as numerous as they used to be, "finds" are still to be made. For example, a very old friend of THE MODEL ENGINEER from the West Country dropped in on me the other day to tell me of a discovery he had recently made when visiting Norfolk. He had got an introduction to a local resident who had been collecting items of engineering and electrical interest for many years, and had in his collection some particularly interesting engine models which, outside the family, probably few people ever saw. My West Country friend is doing his best to get some pictures and a story for the delectation of his fellow readers in due course. A prominent education authority in London, fired by a visit to one of our Exhibitions, recently started collecting old engine models and has managed to secure some really fine examples. Later still, another London reader has picked up in a second-hand shop a good specimen of the best type of model locomotive sold some fifty years ago. I am quite sure that a good many interesting old-timers are yet to be discovered. It does not follow that their present owners desire to part with them, but these old models nearly always possess some special features which are worthy of description, and so I am glad at any time to have news of their discovery. There is a vast difference between a recently-made model of an old-timer, and a model which was contemporary with its prototype. In the antique furniture business it is well known that the old table or sideboard is not always as old as it looks. The imitator is so perfect in his craft that it requires sound knowledge and very critical inspection to detect the "fake." I do not know of any attempts to "fake" an old-time model, except, perhaps, in the world of model ships. The man who nowadays selects an old-time engine as a prototype and models it, is doing a perfectly legitimate and very interesting piece of work. He does not pretend that he has done any more than reproduce in miniature an historic prototype. But in course of time his modern-made model may pass out of his hands. It may become rusty and dusty and neglected. Then a collector may come across it and imagine that he has made a real "find." It should not, however, be difficult to tell whether a model is of modern construction or not. In general, the character of the castings and materials employed is a good indication. The perfection of finish is another guide, since with the accurate tools now available much of the work will be machine finished, where in days gone by it was shaped and finished by hand. The screws and screw threads used give yet another test of the age of a model, for small nuts and bolts and standardised screw threads and screwing tackle are conveniences of a modern era. Sometimes one sees an old-time model obviously made by an instrument maker or someone skilled in the production of miniature work, and in such cases the craftsmanship may be of a more exact and better-finished order. But even then the instrument maker's touch is sometimes betrayed by the too lavish use of brass as a material of construction, and by the adoption of a lacquered finish. The study of the workmanship of old-time models is almost as interesting as a study of the design of the prototype.

I am glad to hear of increasing activities in the world of model engineering societies. The New York Society are embarking on their first Exhibition, to be held this month, and I have no doubt it will be an inspiring success. Things are moving in Edinburgh, where a meeting is shortly to be held to discuss the establishment of a workshop and other facilities for members. A note relating to the latter will be found in the Club column of this week's issue, and in next week's issue the report I have just received from the New York Society will appear.

* * *

Mr. Kenneth W. Crabb, of Lundin Links, N.B., writes me a friendly little note to remind me of a pleasant chat at our last Exhibition. He signalises his good wishes for the New Year by sending me a calendar for my office which has the novel feature of giving a sample of Scottish humour for each day in the year. The stories are all fathered on Aberdeen folk; some of them are old friends, but I have no doubt I shall get some smiles from the calendar during the course of the year. I do not want to keep all the good things to myself, so I pass on one or two short items for your enjoyment. Here they are: "A fan lasts Aberdeen women a lifetime. They fold the fan and wave their heads." "The Aberdeen grocers are sending their eggs to the B.B.C. to be re-laid." "An Aberdonian removed to a house opposite a church with a clock, and stopped his watch." "When Aberdeen children ask for ice cream, they are told ghost stories to make their blood run cold." "When Woolworths opened a 6d. store in Aberdeen, one of the natives asked for the boot department." "Mirrors were invented by a Scotsman to give Englishmen something to laugh at." That last little item is, of course, a gentle dig in the ribs for the Southerner, so to restore the balance I will quote one final paragraph of real importance. "News having just reached the Granite City that every cloud has a silver lining, all the Aberdonians are learning to fly." Now let us be serious.

* * *

A recent mail from overseas brought me two papers from friend John Matthews, of Chicago, in which the Exhibition recently held by the Chicago Society of Model Engineers is illustrated and described. Mr. Matthews' own model locomotive figures prominently, and I also see an interesting model of Trevithick's historic engine, built by Mr. Elmer C. Hayward. The *Chicago Daily News* describes the show as a "Santa Claus wonderland on a scientific scale," and incidentally expresses surprise that Mr. Hayward's model "actually runs." From Ladysmith, Natal, Mr. G. S. Brown sends me a copy of the "South African Annual," as a "mark of appreciation of the many pleasant hours I derive from your interesting weekly." The "Annual" is a remarkable production: it contains articles and photographs on all phases of South African life, and is illustrated and printed in a stylefully equal to the best magazine productions at home. I have enjoyed looking through it very much.

Percival Marshall

THE "GENERAL UTILITY" LOCOMOTIVE.

The writer is not infrequently asked what type of locomotive he would adopt if confronted with the problem of making a selection for purposes of a general character.

One of the best of these is the 2—6—0, inasmuch as it can with suitable proportions undertake quite fast main-line express duty, and has a sufficiency of adhesion and boiler and cylinder power to deal with heavy perishable and freight trains. Some quite respectable speeds are being worked to-day in passenger service by engines of this general character having cylinders 20 ins. or 21 ins. diameter by 26-in. or 28-in. stroke, coupled wheels of 5 ft. 8 ins. to 6 ft. diameter, a boiler of round about 2,000 sq. ft. total heating surface, and an adhesion weight of from 56 to 60 tons.

It might be urged that as high-speed work is involved, the 4—6—0 type is superior, and it would be difficult to controvert this assertion on general grounds. Assuming the main dimensions to be the same as those outlined, there would, of course, with the 4—6—0 be some sacrifice of adhesion and perhaps a little more in the way of first cost and maintenance charges. However, this would not be sufficient to deter one from making the selection if the road to be worked over abounded in curves or had other characteristics such as a rather lighter rail section, or where culverts and bridges were more numerous, and perhaps not so well able to support the heavy individual axle loadings.

In designing locomotives and making a selection of type for specific purposes the track and bridges must always be carefully considered, and it is here that the locomotive engineer sometimes finds himself in difficulties, inasmuch as he has to reconcile the demands made upon him by the traffic department and the restrictions imposed upon him by the civil engineering department.

In so far as the 2—6—0 type of engine is concerned in this matter of versatility in working different kinds of trains, it was only recently noted by the writer that an express train running at an average speed of between 52 and 53 miles per hour was worked over an important section by a 2—6—0, and later in the day the same engine was seen hauling a freight train weighing probably at least twice as much as the passenger train hauled on the outward journey.

WORKSHOP TOPICS

Clock Repair Work.

Making a New Spring Barrel Arbor for a Dial Clock.

The job described in this note was carried out, among other repairs, upon the movement of a fine old-English drop-dial clock, which was so old and in such a derelict state that it was purchasable for only a few shillings. It is a large clock, the wood frame of the dial of which is octagonal, of rosewood veneer, inlaid with pewter. The drop case matches, but, as often happens with these, the wings of the case are missing, and although this makes no difference in the going or use of the timekeeper it will add to its appearance when they are replaced. A matter of design, as well as of careful craftsmanship, which may make a further note in this journal in the future.

A Reference.

Regular readers will find full illustrated particulars in this column on pages 320-21 of Vol. LV (September 30, 1926, issue) of THE MODEL ENGINEER, wherein the construction and repair work is referred to as carried out on an English dial clock. In that article, Fig. 3 shows how the spring barrel is constructed in relation to its arbor, and, further, how the barrel was bushed to make better fitting bearings for its support. Fig. 2 also indicates the relative placing of the spring barrel and fuzee, together with the fixed ratchet of the barrel, and the construction of the fuzee stopwork. All these details have reference to the following, and will not be repeated here, but will be amplified by describing how the spring arbor gears with the spring.

What Gave Rise to the Repair.

The actual repairs of the clock as a whole were completed, and it had been going to time for several months, when, on an occasion, some fifteen minutes after winding and following a mysterious sound which no one could account for, the clock stopped. On setting the pendulum again in motion, it immediately became evident that the power was off and nothing doing at the

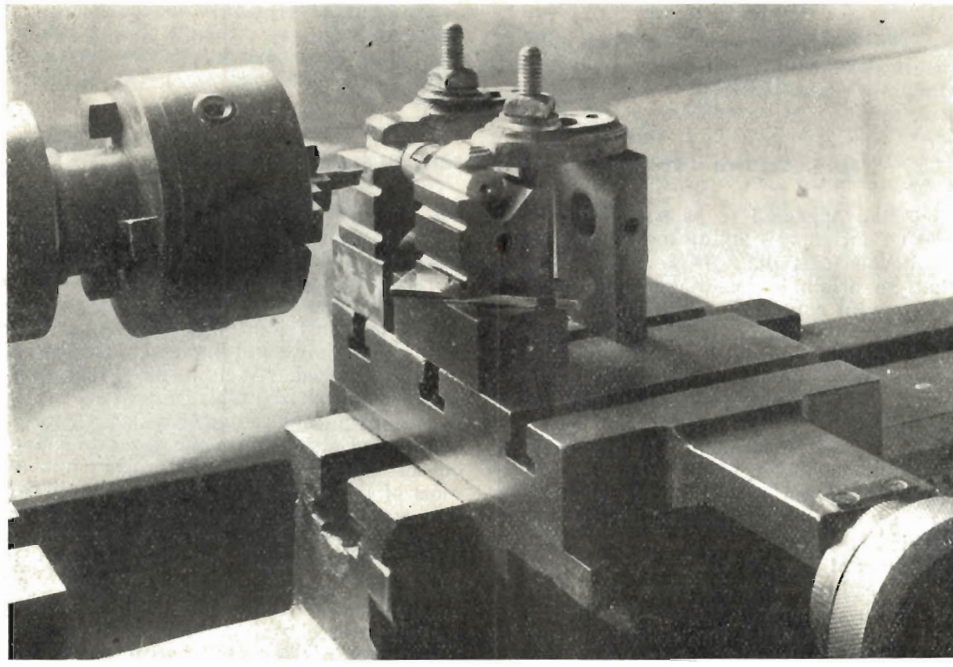


Fig. 3.—The Lathe Setting for Cross Slotting to Form the Arbor Hook.

escapement. Further, a turn of the fuzee barrel arbor soon indicated that either the spring had gone or the gut connecting the fuzee and spring barrel had parted. On taking off the face and movement, after removing the pendulum, it became obvious that the latter was the case, and not only that but the barrel whipping down almost instantaneously had accounted for the mysterious sound, and its rapid revolution had caught the loose end of the gut and wound it tightly between the front motion plate and the barrel cover, forcing out the plate and fracturing the square end of the barrel arbor across the line of the taper-pin hole. This hole carries the pin to retain the wheel of the fixed ratchet against the outside of the motion plate. Why this had occurred was due to the fact that the barrel fitting in the hole a riveted or driven-in pin, the head of which is shaped as a hook, but this is not good practice as it weakens the arbor. A much better plan is to have the hook part and parcel of the arbor. A mechanic neat at smith's work might nick up the hook from the arbor while hot, but this is a difficult matter to carry out and keep the core of the arbor a fairly constant cylinder. Really the best way to do it is to mill and file the hook out from a solid ridge formed on the arbor, and this is how it was done in the present case. It will be seen that it can be done by casting the hook on and then only by rendering the casting malleable can it approach suitable strength. In any case this has proved unsuitable, as described in the foregoing.

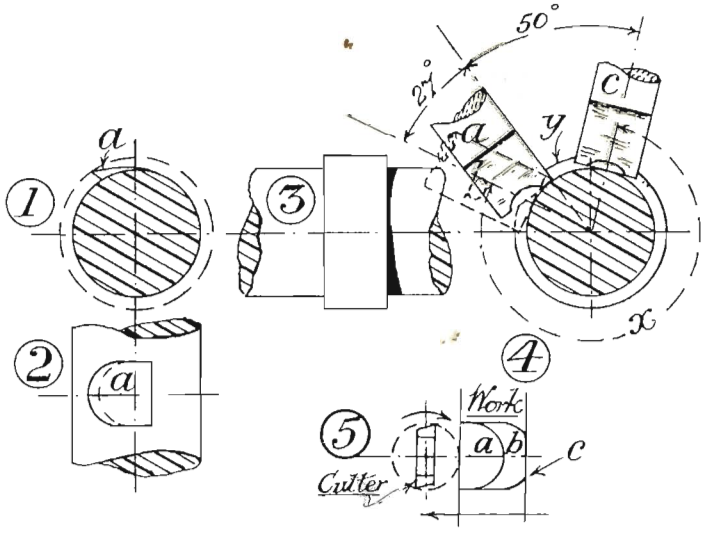


Fig. 4.—The Form of Finished Hook, the Turned Collar, and Stages of Slot Milling them.

arbor, which had appeared to be a steel drop-forging, turned out to be nothing more nor less than a malleable casting. One thing was certain that no original clockmaker had ever put such an awful contraption into so good a clock, and one could only assume that a subsequent clock mender had put it in, presumably because it was cheap and easy to fit. Why such things are made is a mystery, except it may be that the attachment of the spring hook is a simple matter. That is, cast on. In any case there was nothing for it but a new arbor, and of mild steel this time, and properly made with an all-in-one spring hook. The making of it is the subject of this article.

The Spring Hook of the Arbor.

This hook projects slightly from the core surface of the arbor and at its centre catches in an oval hole cut along the ribbon of the spring at its centre extremity. Sometimes this hook is made by drilling the arbor across and

An Apology and Hint.

So far as this note has gone it will help such clock enthusiasts who deal with English dials to recognise the symptoms, when the gut or its equivalent line has broken, which explains this preamble. In the original note as per the reference given, only a gut line and chain are referred to as being used. As a matter of fact, steel lines are to be purchased which are more satisfactory than gut and not so expensive as a chain. The last-named also require the fuzee to be suitably cut to house the chain in proper linkage, and most of the older clock fuzees are only cut with the characteristic spiral conical groove to take something round as a gut or steel line. The latter is a spun line, or fine steel rope, which the writer is using and has not yet fitted, but he understands that some skill is required in forming the chucking knots both in the fuzee barrel and in the spring barrel, as the material is rather springy and intractable. A point to

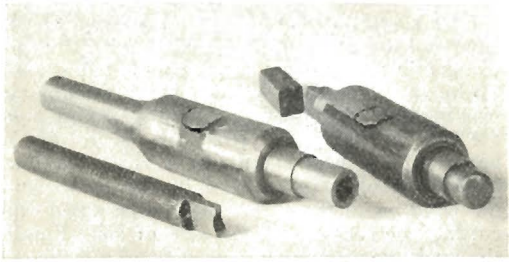


Fig. 1.—Right to left: The Fractured Arbor, the New Steel Arbor with Finished Hook and Pivots, and the Slotting Mill used.

note is that the rubbing point on the arm of the fuzee stop should be nicely burnished, as it appears likely that if rough it may wear—especially gut—each time the stop functions. It appears that this is what wore the gut to a fracture in the present case.

Some Photographs.

Fig. 1 shows, to the right, the old malleable cast-iron arbor with its fractured end, showing the cast hook, and how the core had to be undercut filed to make it function (and then indifferently). The centre view is the new steel arbor with the hook, as finished, and with the pivot ends turned to size, but the squared end not yet formed. The final left-hand view shows the ¼-in. slot drill used for cutting the clearances before and behind the hook. Fig. 2 shows the arbor when finished and squared in the barrel. In front of the same view is the original fixed ratchet wheel, which is square holed to go on the squared end of the arbor. It stands on the outside of the plate and is usually keyed

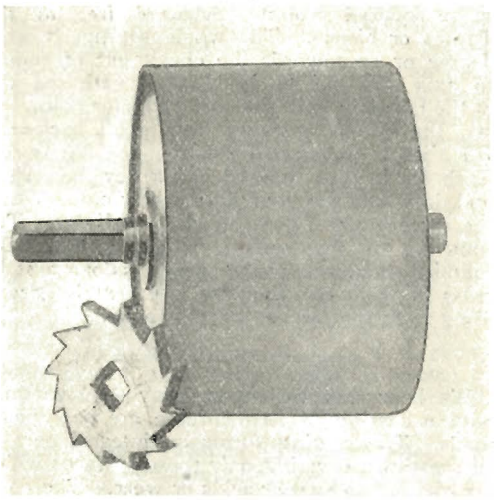


Fig. 2.—Finished Squared Arbor in Barrel with the Ratchet wheel.

back by a cross taper pin passing through the square. It holds the spring arbor rigid against the pull of the spring by a springless pawl screwed to the front of motion plate.

Fig. 3 shows the lathe setting for holding the job during the milling of the clearances. It will be referred to again.

Making the Arbor Hook.

Fig. 4, a group of numbered sketches, shows how the hook was formed. No. 1 is a cross section of the core showing the shaped hook at *a*, and No. 2, a plan view, the shape of the hook the other way. It is undercut, as dotted, to make a positive grip of the spring which cannot then unlock while the tension is on. No. 3 indicates how a collar was turned the width of the hook in centre of core of arbor, and of diameter twice the projection of hook more than the diameter of core (*i.e.*, to the dotted circle in No. 1). No. 4 indicates the relative positions of the slots cut across collar to clear before and behind the hook. The fore part of hook was formed with cutter at *a*, the work being set with its centre level with top of cutter. Dotted position *b*, about 27° further round, shows how this clearance was widened. In this case the work is set with its centre level with lathe centre. Position *c*, about 77° from *b* in the other direction, and with the work on centre, shows the position for cutting the clearance behind the hook, and leaving the piece *y* to form it. What remains of the collar, as represented by the circular dotted line *x*, is cut away by hand shaping in the lathe, pulling the job round by hand.

The Machining Procedure Generally.

A piece of good mild steel (Bessemer steel, in fact) was chosen, rather larger than dotted circle *a* in No. 1; and about ½ in. longer than necessary for the whole arbor. This was centred truly, and turned to the collar diameter all along. Then the front end was turned down nearly to the larger pivot diameter up to a shoulder, leaving sufficient length of the collar diameter to form the core and back pivots when the centre had been removed. The position of the hook was then located, and the core turned on each side of the collar to its finished diameter, leaving the collar as in No. 3 of Fig. 4. It was in this condition, as shown set up in Fig. 3. Here two parallel blocks are put flush on the front edge of boring table of lathe, having on them a pair of Starrett small vee-blocks. The lesser vee at the back carries the smaller diameter, and the greater vee at front the core diameter of the roughed-out arbor. To bring the arbor level required about ¼-in. packing under the front vee-block. The job was then set with its centre level with the lathe centre. The cutter is seen in the chuck, and the first setting had extra ⅛-in. packing under each of the bottom packing blocks to bring the work centre level with top of cutter. The clamping is on either side of the

collar well apart. So set, the cutter was traversed across, cutting a groove as at *a* in No. 4 Fig. 4. The extra ⅛-in. packing was then taken away, the job given a turn upward to bring the hook face level with top of cutter (about 27°) and again clamped and traversed across, cutting extra clearance as at *b* in No. 4. The job was then loosened and set as for *c* in No. 4, leaving about ⅛ in. of circular width of collar at *y*, and a third traverse made. Each traverse was made in two cuts, one nearly down to face of core and a second finishing cut just touching the core. The feed for depth was put on by the lead screw, and the traverse by the cross feed, the handle for which is seen at extreme bottom right in Fig. 3.

A Point in Slot Milling.

In slot milling clear across the metal, especially in working on a light lathe, care must be taken when breaking through. This particularly applies when milling with a two-edge cutter. The diagram No. 5 Fig. 4 will explain why. Here we are looking axially on to the cutter to the left, and which is revolving as the curved arrow. The work to the right being traversed as the straight arrow, represents the collar being slotted across. At the start and all across, as in position *a*, the resistance to cut is against the traverse screw. When we reach the position *b* on the work, however, the resistance to cut is modified, giving a tendency to over feed when cutter is horizontal, with the result that the returning edge of cutter will cut rankly at the point *c* and probably push the work ahead of the backlash of traverse screw. This will almost surely result further in a broken tool or badly shift the job. To obviate, first ensure high speed to the tool, particularly at that point. Next preserve a positive and constant feed. Third, make sure that the cross-traverse slide is screwed up by its sliding liner evenly to the maximum consistent with proper sliding. The same applies to the saddle adjustment. Finally, see that all clamps are properly bearing on the work, in such position that they lie horizontal with the boring table, or, if not, rather higher on the packed side than on the bearing side. Never the other way about. Many a milling job has been spoiled or delayed in the breaking of tools through using the lathe in the ordinary way as to adjustment, and not looking to each and all of the points enumerated. Although apparently easy to perform, milling—if in the interest of its expensive tools only—should never be forced in the matter of feed.

Hand Finishing the Hook.

As seen in No. 2 Fig. 4, the hook is rounded. This and the finishing of its back, and the hand shaping in lathe was done as follows: The latter was done between centres, the carrier being wired to its driver. A sharp rounded pointed roughing-out tool was applied to remove the portion *x* of the collar. This was done in two cuts, roughly, pulling round the lathe backward and forward, and nearly down to core size. A similarly sharp round nose was then applied with plenty of lubricant, to finish flush with the core, using fine traverse per cut. This left it smooth. To finish the back of hook, a hand file, fine cut, was applied, with a slight rocking action along the line of the hook, from the back, the job being held in lead clamps in a vice. Similarly held the hook was rounded by the same hand-file edge on to the work—safe edge down—and cutting the round with the side of file. Finally, the hook was undercut with a fine knife file. If it is possible to make such a file safe on one side without removing the teeth on the knife edge, it will obviate the care necessary to avoid cutting in the core at all.

Finishing the Turning.

This is also done between centres, in which the smaller end is turned down to the pivot size for motion-plate pivot hole, and the larger end for the back pivot hole of drum, and back-plate pivot hole. The shouldering must be carried out so that the arbor has slight end play, first in the drum and next between the plates. This is ordinary turning, and is followed by cutting off the centres by hacksaw and rounding both ends by chucking and filing in the lathe, showing no centres at finish.

Milling the Square.

For this the tail end of core was marked with four dots. Held in a chuck and with a scribing-block set to centre on the bed and some means of dividing into four on the mandrel, four marks at quarter points were put on the core and dotted.

The job was then set again as in Fig. 3, the core being held in the vee-blocks on each side of hook, and there clamped, set with its centre level with lathe centre. In this setting the end to be squared projects backward free of the clamps or blocks. The whole setting slopes a degree or so towards the chuck out of square to axis and the job is clamped with one dot at the tail level with the surface gauge point. So set, the cutter, working from point backward (*i.e.*, job is traversed forward), one flat is cut. Each flat is then indexed in turn by the scriber and dots, and the four flats evenly cut, so that the ratchet wheel goes on about halfway. The finishing of the square, which is left with rounded shoulders by the cutter, is done first by cross filing at the shoulder and next by draw-filing to fit the ratchet wheel exactly.

We hear that carbon or alloy steel castings with a coating of ferro-chrome are now being made. The coating forms an integral part of the castings, covering only those surfaces which are exposed to heat or acids or wear. The coating is hard and tough, and cannot be chipped off or separated by mechanical means.

SHOPS SHED & ROAD

A Column of "Live Steam."

By "L.B.S.C."

A Contrast in Valve Gears.

Many brother loco men have lately asked if I had any close-up photos of valve gears, so herewith offer two by way of comparison. They are very interesting, not only by showing fully the motion details, but also illustrating the great disparity between the gear necessary for a conventional British locomotive and its out-size Canadian sister. The name on the splasher of the former is too well known to require any description of the engine to which it is attached, and there is nothing special to note about the gear itself, which is the usual Walschaerts type as designed by Mr. H. N. Gresley. It looks very light, but does the job all right, being made from a special brand of heat-treated steel. One point of interest is the ball-bearing eccentric-rod. Keep it quiet, but somebody you all know arrived at King's Cross one day and found the ball-race cover missing from one side. It was discovered on the platform at Hornsey—good job it didn't hit anybody when it flew off, as our worthy friend usually comes down the bank from Potter's Bar in a terrible hurry and there would have probably been a funeral. Turning to the other picture, the engine is No. 3100, one of the Canadian Pacific's latest huge 4—8—4's, which rank among the largest passenger engines in the British Empire. An excellent impression of the massive proportions of these engines is given by the driver standing alongside, busy oiling up. He isn't much bigger than the expansion link. (Unofficial history says that a fireman fell out of the cab and by the time he reached ground he had been promoted to driver!) If memory serves me aright, the cylinders are 30-in. bore by 32-in. stroke, the driving wheels 6 ft. 1 in. diameter, and the boiler carries a working pressure of 275 lbs. per sq. in., which is a tidy high one for the ordinary boiler with flat-plate firebox. Those cheery folk who love figures can reckon out how many tons are pressing on each piston-head when the driver opens the throttle; but without going as far as that, it is pretty evident that a good hefty motion is needed to work the 14-in. long-travel piston valves at high speed.

Details of the Canadian Engine's "Works."

Note the peculiar arrangement of big-end and coupling-rod. The full pressure was reckoned to be too much on one crankpin only, so the circular big-end is forked and bushed, the main crankpin working inside the bush in the usual manner. The engine being eight-coupled, the side rods are made in three separate sections; the centre one fits in between the jaws of the big-end fork and takes a bearing on the outside of the bush. Therefore, the big-end thrust is communicated direct to its own pin, and also via the centre section of coupling-rod to the crankpin in the third driving wheel, sharing out the direct push and pull over two crankpins instead of one only. The front and back sections of the side rods are fitted up as on a four-coupled engine and transmit power in the usual manner, working close to the wheel bosses. The return crank, or eccentric crank as our cousins over the pond call it, is exactly the same as on little "Fayette," only one or two sizes larger. It is located in position by a little round pin and fixed by a bolt which cuts the crankpin as previously mentioned in these notes. The expansion link is itself of the open type but has a trunnion plate on either side of it. "Lizzie" the Ford-Pacific, you will remember, had a single trunnion and plate, but worked in much the same manner. The trunnion bearings are supported by girders which are bolted to the overhung guide-bar yoke and also to a steel bracket attached to the main frames. This construction may be followed easily in small work, the parts being simple to make and fit. Note the huge balance weights and the methods of making sure the tyres do not creep; the ring with its bolts is plainly seen in the picture. Now, as the B.B.C. announcer would say, here is an "S.O.S." Will Mr. C. M. Black, to whom I am indebted for the photo of the Canadian engine, please send me his present address. Unfortunately, when having a "clear out," I inadvertently burned my Canadian address list, and my letter thanking friend Black for his pictures came back wrongly addressed. I have a fairly good memory for most addresses; but in order to "make assurance doubly sure" I would be glad to hear from any Canadian brother loco men who have not written for some time, so I can make out a fresh list. I still have all the Canadian S.M.E. addresses, and also Mr. Joslin's.

Making Fittings from Castings.

Why it should be so, goodness only knows, but many brothers still fight shy of a silver-soldering job, however small, and want castings

to make up their gauge columns, turrets, whistle stands and various other blobs and gadgets. Well, if they *will* insist, I guess their wants must be supplied; so I have made up a number of little patterns for these oddments, and they are being sold by Mr. Kennion and also by Hamleys. Included in the list are combined fountain (or turret) and whistle valve, plain two-way turret, water gauge of the Stroudley-Washington type, top-feed clack fitting, side clack, two sizes of angle valves, ordinary straight globe valve, "Helen Long" and "Fayette" type mechanical feed pump, and other accessories. All being well, will give detailed instructions for making up the little parts from castings. Personally, I prefer to use rod material and silver-solder the pieces together; but I certainly must admit that there is a slight saving of time if a suitable casting is available—especially if your blowlamp nipple is choked, you break off the pricker in it, haven't got another nipple, and it is 9.1 p.m. on Saturday. Oh, boy—'nuff sed!

"Fayette's" Trailing Wheels and Axle.

Sorry, brother loco men, I beg your indulgence. What with Christmas gramophone repairs, overseas correspondence and "one darn thing after another" all nonstop, I clean forgot to give the sizes of trailing wheel and axle. The trailing wheels are 1⅝ ins. diameter, same as bogie; the axles are also the same except that an outside journal is left projecting ⅜ in. from the wheel seat and 3/16th in. diameter, the holes in the axleboxes being left large enough to allow these to run easily. I don't think you will need a special drawing for this little item; but if anybody does, they can refer back to the description of the wheels and axles of the Vanderbilt tender. Axles can be the same as shown there and wheels ⅛ in. bigger.

Cylinders.

Now we come to *the* job, which is the most important on any engine—machining up the cylinders. I would like to point out here and now, that it is a bad error to buy finished cylinders if you have a lathe and know anything at all about turning. Practically all the "finished" cylinders I have seen have needed *something* doing to them before they could be considered satisfactory, and every engine which has been in the little N.L. shop for repairs has suffered from cylinder and valve gear trouble. It is by attention to cylinders and valve gear that good results—great power combined with consistent good steaming and low consumption—are obtained. "Fayette's" cylinders are unique in having the largest ports ever cut in the cylinders of a 2½-in. gauge engine, the steam ports being ¾ in. long and 3/32nd in. wide, and the exhaust port no less than ⅝ in. by ¼ in.; so now you know why she barks like an "all-station" dog (as one of my young relations puts it) when you open the regulator with a load behind the tender. The credit of using such comparatively enormous steam and exhaust orifices is due to Mr. G. P. Fitz-Gerald, and results have fully justified his designing. I am pretty sweet on big ports myself, having always advocated and fitted the biggest I could get in the usual type of steam-chest, going up to ½ in. long for ⅝-in. bore cylinders, and so *pro rata*; but our worthy friend wanted them bigger still, so they were duly put in. "Out-size" ports are openly derided by one or two "experts of the old school," but you all know the old saying about "the proof of the pudding," and if you want power, it is no good bottling up pressure in the boiler and starving the pistons. "Full pressure on the pistons at the instant she passes dead centre" is the motto for power, brothers all, and the only way to get it is by big pipes and ports. If you want economy, the way to get that without losing power is to cut off early—notch the beggars up like a big 'un. Well, reverting to "Fayette's" cylinders, my original patterns were passed over to Hamleys, and the castings they supply from them are made by Messrs. Broad, Salmon & Co., whose work was reviewed by Mr. Marshall and favourably commented upon some time ago in this journal. I have machined up a couple of sets, and can honestly say that the metal (special hard gun-metal) is the nearest approach to aero bush metal I have ever seen outside of the munition shop. The old soft "gun"-metal which is really cock metal (a mixture of copper and lead) and the glorious compound known as "best machinery brass" (with apologies to ancient price lists of departed firms) are not in the same street with the samples I have operated upon; and if all the cylinder castings are the same, nobody will have any cause to grumble. Well, let's "get on with the washing."

Setting Up for Boring.

Although I have fully described how to machine cylinders in back "Live Steam" notes, there are many who have not the issues containing them, and in "Fayette's" cylinders there are some different procedures to be followed, especially regarding ports and passages; so will detail the job right through. There won't be any excuse then for any locomotive refusing either to follow "Fay's" good example, or go one better than she can. There are two methods of boring—take which road you please, or whichever your lathe is best suited for. First, the angle-plate method, which is my favourite; second, the boring-bar method, which requires a self-acting lathe and usually takes more time to set up the job. For the first, the usual small faceplate plus a 2-in. by 2-in. angle-plate and a few odd bolts and nuts are all the "doings" required. No elaborate marking out of the casting is necessary, as the Hamley castings can be located for boring by the core hole. Tip: if you are going to do the job on a plain lathe without any self act, nor hand-operated

A CONTRAST IN VALVE GEARS.

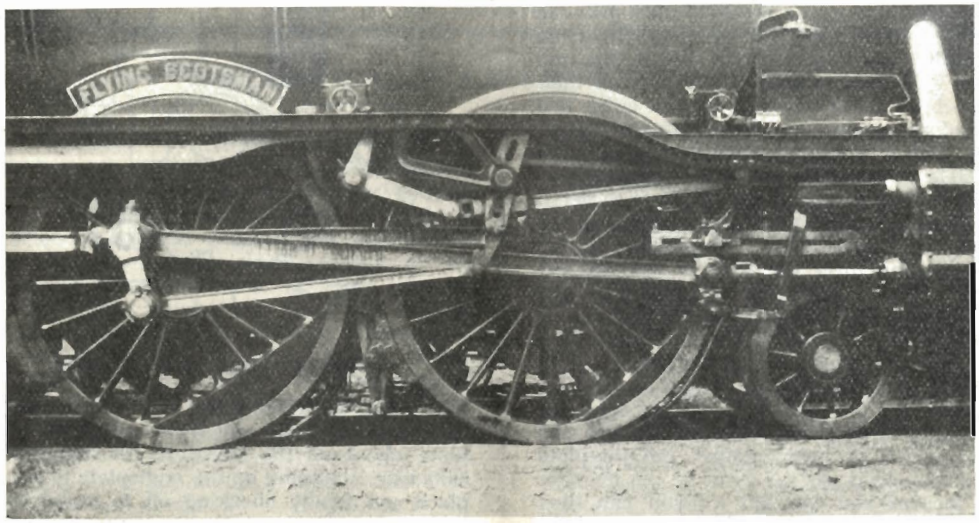
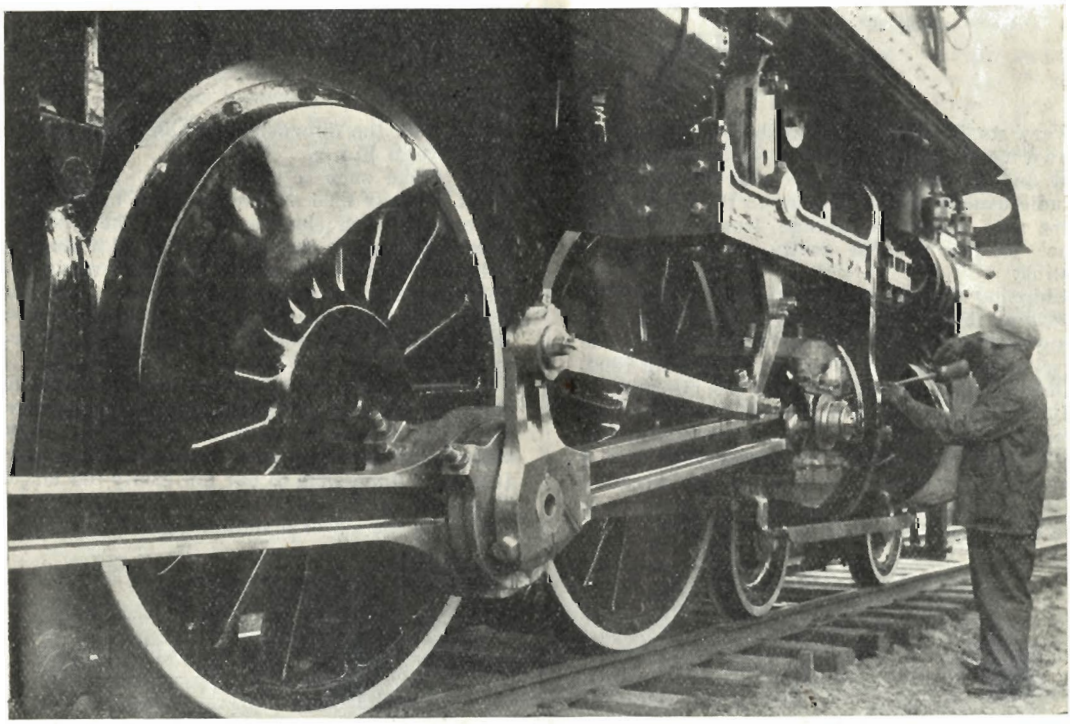
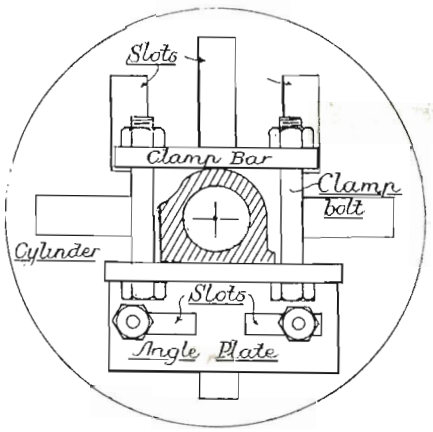


Photo by] VALVE GEAR OF L.N.E. PACIFIC. *[Driver Irvin.*



A BIG END WHICH REALLY IS.
ENGINE NO. 3100, TYPE 4—8—4, CANADIAN PACIFIC RAILWAY.

lead-screw which traverses the saddle along the bed, get your top-slide to stand as near parallel to the centre line of mandrel as possible. This is easily done by putting a piece of metal in the chuck, and adjusting the top-slide until you can turn it to within .001 in. of parallel in an inch length. Don't get scared stiff at this, my munition girls used to do it often, quite on their own, to check off if anything on the lathe had moved before starting on a fresh batch of pieces. Just try with a "mike" after a trial cut and adjust slide if necessary, and I'll be greatly surprised if you take more than four cuts to get it right. Next take your castings and clean up the port face (if it needs it—my sample didn't) and just file roughly over the ends to remove any burrs or "fins." Bolt your angleplate to the lathe faceplate and mount the cylinder on it, port face down, securing to the angleplate by a bridge piece over the cylinder body with a bolt either side. Let the cylinder flange overhang a little. First set the cylinder block square with the faceplate, by checking with a try-square, the stock of which is held against the faceplate whilst the blade is got as near to the cylinder bolting face as you can get it; you can then "sight" it for parallelism quite near enough to be satisfactory. No need to be *quite* exact, as this face has to be machined afterwards and the



Setting Up "Fay's" Cylinder for Boring.

machining will correct any small error. Tighten up the clamp bolts and then wangle the angleplate about on the faceplate till the core hole runs true, clamping up the angleplate to the faceplace and finally checking off to make certain it hasn't shifted whilst the bolts were being nipped up. They often "sell you a pup," or try to, anyway.

SMALL SLIDE VALVES.

By "Five-Eighths."

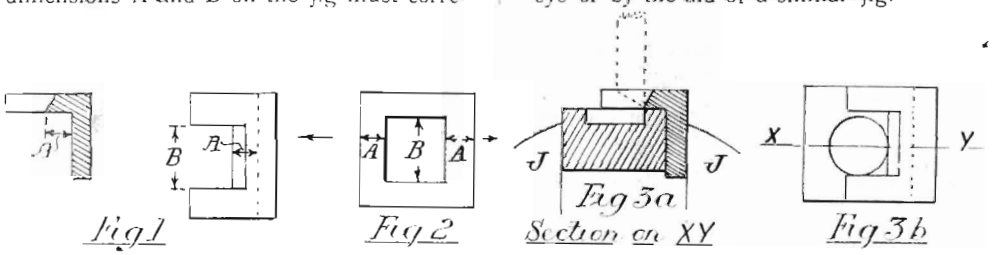
Very small slide-valves are best made out of drawn metal, partly because it wears better than cast and partly because the slot for the valve spindle usually comes so near to the cavity that there may easily be leakage from the steam space to the exhaust cavity when using a casting.

Chipping the exhaust cavity out of the solid is not so much a difficult as a fiddling job, it being almost impossible to see exactly where the chisel edge is placed. The very simple jig illustrated in Fig. 1 entirely removes this difficulty.

It is filed up out of a piece of brass, or preferably steel, angle, any internal radius in the angle being filed away. Suppose Fig. 2 is a drawing of the slide-valve required, the direction of its motion being as shown by the arrows. The dimensions A and B on the jig must correspond with the dimensions similarly marked on the valve in Fig. 2.

To make such a slide-valve a rectangular block is easily filed or machined up to the right dimensions with close accuracy. The next job is to chip out the cavity. First of all a shallow hole is drilled in the centre and then made flat bottomed with an end-mill or a D-bit. Next the jig is used as indicated in Fig. 3, where A is a section along XY, and B is a top view. JJ are vice jaws.

A cold chisel, shown dotted in A, is used to chip out one end of the rectangular recess, then the jig is placed on the other end of the slide-valve and that end chipped out in the same way. It is thus impossible to cut the cavity too large. The sides of the recess can be trimmed up by eye or by the aid of a similar jig.



Making Small Slide Valves.

LOCO. PROTOTYPES NEWS and NOTES

By Chas. S. Lake, A.M.I.Mech.E., M.Inst.L.E.

Some Remarkable Locomotives for Overseas.

Just recently three of the larger locomotive firms in this country have built types of locomotives for service overseas, and in each of the three cases the engines are remarkable either for their size and weight or for the special characteristics of their design. The locomotives include a 4—8—2 type for the 3-ft. 6-in. gauge, South African Railways, a 2—8—2 type for the 5-ft. 6-in. gauge, Indian State Railways, and a special articulated locomotive built on the Kitson-Meyer principle for the Kalka-Simla Railway.

The engines for the South African Railways have been built for mixed traffic purposes to the designs and specifications of Colonel F. R. Collins, D.S.O., chief mechanical engineer. They rank among the most powerful engines yet built for the 3-ft. 6-in. gauge, and develop at 85 per cent. of the boiler pressure a tractive force of 44,200 lbs. The total weight in working order with tender is 171.15 tons. The design incorporates certain American features, such as bar frames, power-operated fire-door, "cowcatcher," etc., with others which are characteristic of British locomotive practice, and not only in size but in general appearance also the locomotives are of a noteworthy description.

They have two outside cylinders, with piston valve steam-chests above them, the valve gear being of the Walschaerts pattern. The cylinders drive the second pair of coupled wheels, and power reversing gear is applied. The boiler is of very large size, the diameter of the barrel at the front end being 6 ft. 2¾ ins. inside and length between tubeplates 20 ft. 0½ in. The cylinders have a diameter of 23 ins., and a piston-stroke of 28 ins., the coupled wheels being 4 ft. 9 ins. diameter. The rigid wheelbase is 10 ft. 6 ins., and total wheelbase 35 ft. 8 ins.

The boiler carries a pressure of 20 lbs. per sq. in., and with the superheater provides 3,465 sq. ft. of heating surface. The firebox is of the round top pattern, and has a combustion chamber attached to it, this latter extending into the boiler barrel. The grate area is 48.3 sq. ft.

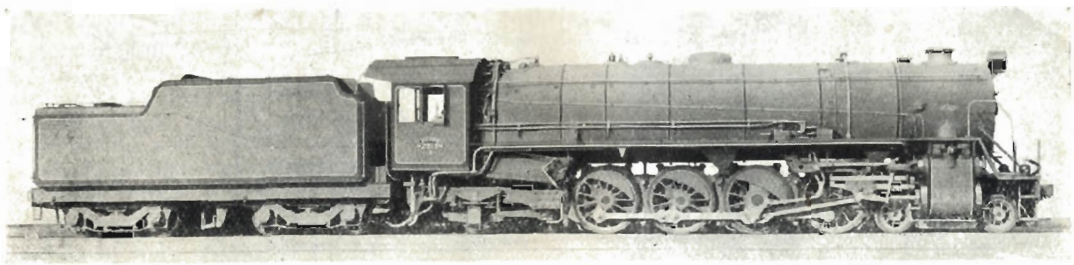
As the photograph reproduced herewith shows, the tender is of the double-bogie pattern; it accommodates 6,000 gallons of water and 12 tons of coal, and weighs in working order 66 tons 2 cwts. The boiler is fed by means of a top-feed arrangement, and an electric headlight is fitted. The engine may be regarded in every sense as a remarkable example of design for the 3-ft. 6-in. gauge. The North British Locomotive Co., Ltd., are the builders, and the order comprised 29 engines.

New 2—8—2 for India.

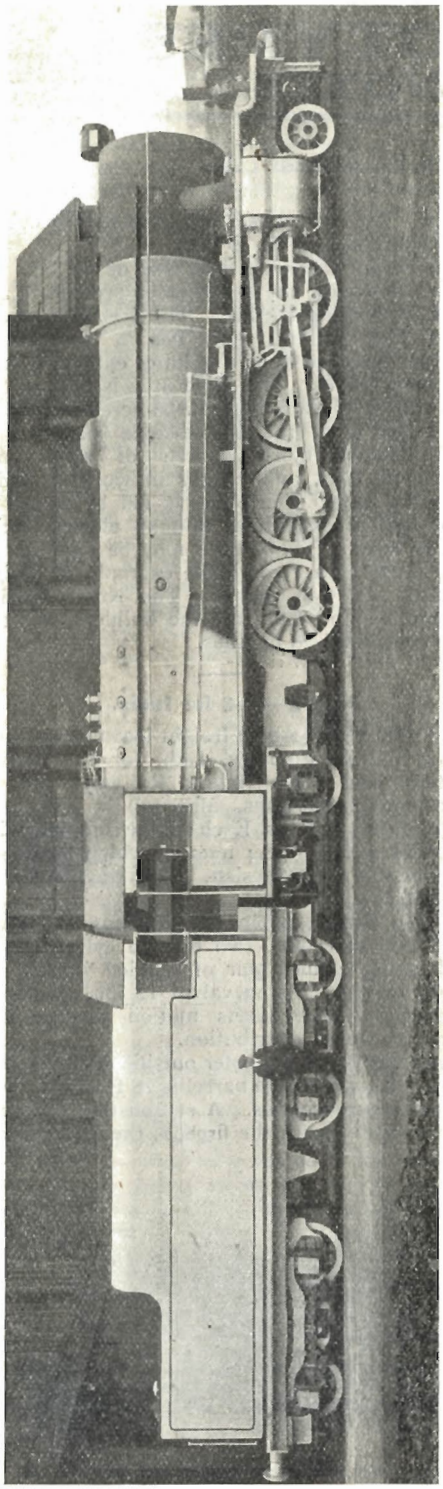
The new 2—8—2-type freight locomotives built by the Vulcan Foundry, Ltd., for the North-Western and East Indian Railways are of exceptional proportions, although in this case the gauge is 5 ft. 6 ins. Each engine complete with its tender weighs 198.4 tons, of which 89.8 tons are available for adhesion. The tractive effort is 48,086 lbs.

In this design, as in the previous one illustrated and described, two outside cylinders are fitted, and the third pair of coupled wheels are directly driven. Piston valves 12 ins. diameter, operated by Walschaerts motion provide the means of steam distribution.

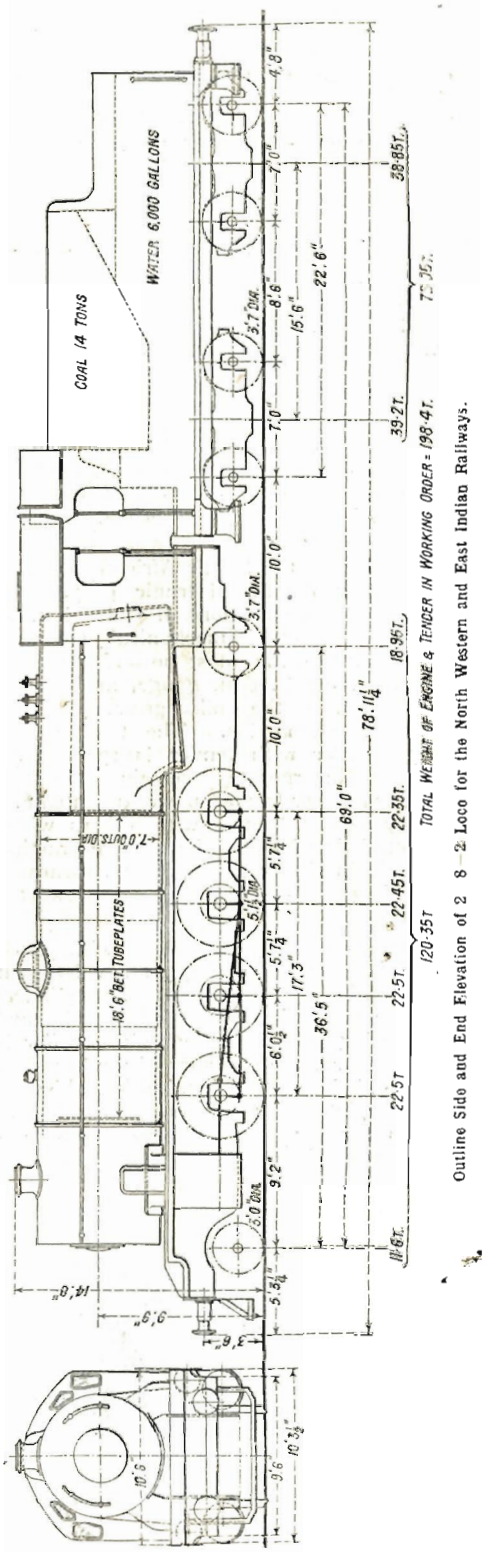
The boiler has a diameter outside at the firebox end of 7 ft., whilst the barrel is 18 ft. 6 ins. long between the tubeplates. A combustion chamber is incorporated with the firebox, the latter being



One of the 29 Engines for the South African Railways (3-ft. 6-in. Gauge) being built by the North British Locomotive Co., Ltd.



New 2—8—2 Type, 5-ft. 6-in. Gauge Loco for the North Western and East Indian Railways.



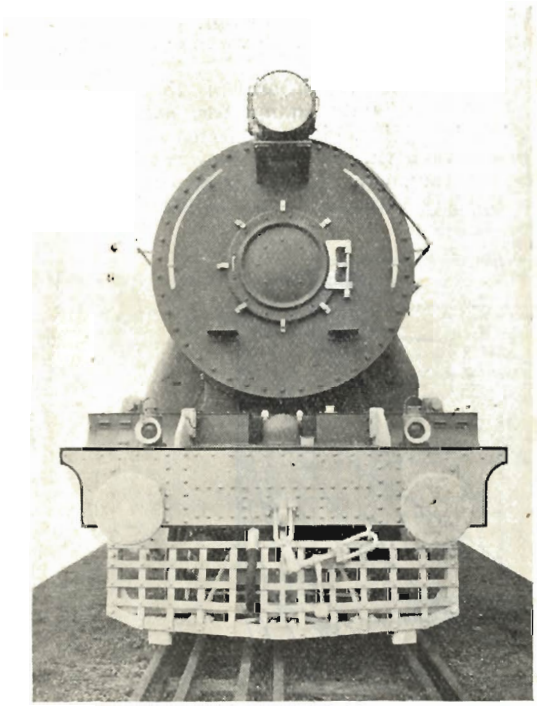
Outline Side and End Elevation of 2 8—2 Loco for the North Western and East Indian Railways.

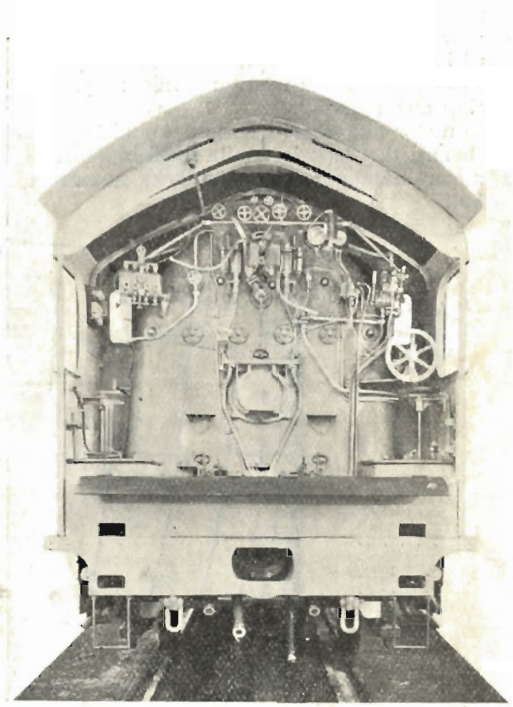
of the wide type equipped with the shaking type of grate providing 60 sq. ft. of grate area. Another feature of the boiler design as a whole is that the firebox contains arch tubes, whilst the superheating apparatus contained within the barrel adds 763 sq. ft. to the heating surface.

Some of the engines are adapted for burning coal, and others for oil fuel, and in the latter case it is of interest to note that an additional safety valve is provided. The cylinders have a diameter of 23½ ins. and a piston-stroke of 30 ins. The coupled wheels are 5 ft. 1½ ins. diameter, and coupled wheelbase 17 ft. 3 ins. The total wheelbase of the engine, without tender, is 36 ft. 5 ins. The total heating surface, together with arch tubes and superheater, amounts to 3,777 sq. ft., and the boiler carries a pressure of 210 lbs. per sq in.

A system of spring compensation is included in the design, the springs of the front truck being compensated with those of the leading and second pair of coupled wheels, whilst those of the driving and trailing coupled wheels are similarly compensated with the springs of the carrying wheels at the rear end.

The tender carries 14 tons of coal and 6,000 gallons of water. The Kitson Meyer articulated loco referred to in the first paragraph on page 55 will be dealt with in our next notes.





Front End and Cab View of the 2—8—2 Type 5-ft. 6-in. Gauge Loco for the North Western and East Indian Railways.

NEW PANEL FOR CHARGING SIX VEHICLE BATTERIES.

A new control panel, announced by the General Electric Company of America, is designed for charging six vehicle batteries, each of the 42-cell, 13-plate type. The panel is for use in conjunction with a 27-kilowatt 110-volt generator driven by a 40-horse-power, 550-volt, three-phase, 60-cycle electric motor. The latter has a magnetic starter.

On the generator section of the panel are mounted a snap switch for controlling the magnetic starting switch; a tumbler switch for full-automatic shut-down; a field rheostat; a voltage regulator; an overload and shunt-trip circuit breaker with a circuit opening auxiliary switch; auxiliary and line contactors, and an ammeter and a voltmeter. The auxiliary contactor, controlling the line contactor, is adjusted to pick up at a proper voltage to ensure charging. Its coil is connected through an interlock on the motor starting switch, thereby preventing the set from "motoring" if the line voltage fails.

An ammeter on a swinging bracket indicates the amount of charging current delivered to the various batteries. Their charging voltages are indicated by a voltmeter mounted on the generator section of the panel.

THE T.-S. "GLENSANNOX."

A Modern Clyde Pleasure Steamer.

By A. S. Miller.

(With Coloured Supplement given with last January 3rd Issue.)

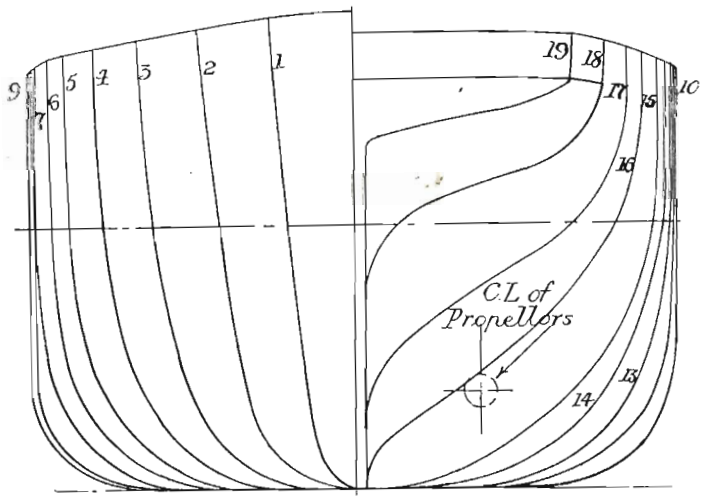
(*Concluded from page* 37.)

The deck should be cut from thin, say, 3/32nd-in, yellow pine, thoroughly seasoned, or plywood of the same thickness. Do not make it too heavy. A rebate is required along the whole length of the saloon sides and end, and the deck should fit into this. Planking should be done by a fairly hard pencil drawing parallel lines ⅛ in. apart. Cross pieces should be pinned and glued underneath at intervals to prevent warping and twisting.

The motor and bevel gearbox should be fitted now before the deck is finally fixed in position, the motor standing on wood blocks screwed to the hull

from 22-gauge plate shaped and let into grooves cut in a boss turned from 5/16th-in. brass rod and then soldered. They revolve outwardly and a speed of about four miles an hour is obtained. A speed in keeping with the type of vessel should be aimed at, the original doing 21½ knots. The shaft tubes are filled with vaseline and are quite watertight.

The accumulators are of the unspillable marine type, three in number, each 3 ins. by 4 ins. by 3½ ins. high, connected in series, and they give a run of about two hours, more or less continuously. Control is by a rheostat fixed to the deck between the two aft lifeboats. Light-



Body Plan. Scale: half full size of model.

A 6-volt Nautilus motor was chosen, running at 2,500 r.p.m. and driving the two propellers through bevel gears mounted on a gearbox built up from 1/16th-in. sheet brass with bearings soldered in and turned up, all as shown in the drawings.

The inner ends of the shaft tubes are carried by a brass bracket screwed to the bottom, while at the propellers the tubes are also carried by a light built-up bracket screwed to the hull. Long bearings are fitted to take 3/16th-in. rustless steel shafts, and the propellers are 2¾ ins. diameter by about 2½ ins. pitch. They are made

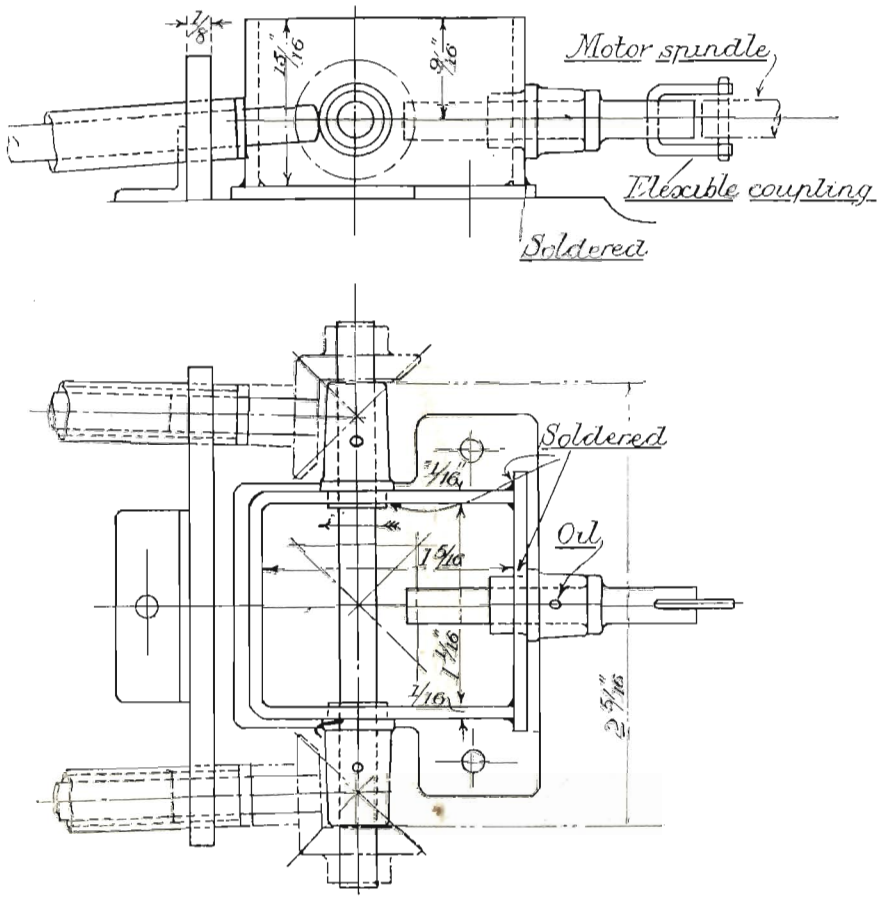
ing is provided by coupling in series two of the 2-volt accumulators and connecting to a small switch controlling all the inside lights and port and starboard bridge lights.

To return now to the deck fittings and erections. The charthouse carrying the bridge is made entirely from good cedar wood taken from cigar boxes. The panelling is done by taking two pieces of wood, one about ⅛ in. or so thick and one reduced to not more than 1/16th in. thick. The panels are carefully marked out on the thin piece and cut by a fine knife so as to have a clean, straight cut and then this is glued

to the thick piece and the two clamped till the glue is hard. The glass in this is of the obscured variety as thin as possible, and it is put in from the inside as usual. For all this work cedar wood is excellent and for pinning the sides and ends use small dolls pins which can be obtained from any stationer. The drawing shows details of the bridge and house. The bridge carries the engine room and mooring telegraphs and steering column and compass. These were made from ¼-in. brass rod lacquered, while the steering wheel is from a small alarm clock. The handrail stanchions are spaced generally 1 in. apart, and there are three types: those on the bridge and deck-house with two balls, those on the promenade and upper deck with two balls and wood handrail, and those round the stern with three balls without handrail. They were obtained from Messrs. Kelso & Co., Glasgow, and there are fourteen dozen altogether.

The upper deck carries two lifeboats, two funnels and seats and lifebelt lockers. The deck is lined out in the same way as the main deck and a stairway leads down at the after end. The funnels are secured to a small aluminium plate, screwed to the deck, and the whole is secured to the main deck-houses below and the liftable portion of the main promenade deck. The lifeboats are cut out of the solid in mahogany, and they should be as light as possible. Three are covered by a small linen cover secured to pins spaced round the gunwale, while the fourth is fitted with seats and lockers, and left open. They rest on cradles shaped to fit the underside and pinned and glued to the deck. The davits are made from brass wire ⅛ in. diameter reduced at both ends, bent to a radius and fitted with hook at one end and resting in a small heel plate at the other. The pulley blocks are as small as possible and there are four to each boat.

The seats should now be made, and a total



Elevation and Plan showing Arrangement of Power Transmission Gear Drive between the Motor and Propellers.

of 16 are required. Here again the builder may prefer to cut out of the solid, but they become too heavy, and those on this model were built up. There are 20 pieces of wood in each seat 1/16th in. wide, 1/32nd in. thick, and 1 15/16th ins. long. so the easiest method is to cut, say, five strips 6 ins. long, 1¼ ins. wide and 1/32nd in. thick. Draw longitudinal lines 1/16th in. apart and cross lines 1 15/16th ins. apart. With a sharp penknife cut the strips along the long lines and cut off at the cross lines. This will give the slats for fifteen seats, and they should be glued on to the ends with a narrow space between each and projecting very slightly over each end. Each seat is secured to the deck by wood screws from underneath.

The bridge supports and the stanchions carrying the upper deck are made from 1/16th-in. brass wire. The bridge supports have a cross brace fitted, while the upper deck stanchions must be drilled to take the two rows of railing passing through the bought stanchions. To ensure these holes being absolutely in line a jig should be made, and a simple one is shown in the sketch. The ventilators were bought from Messrs. Bassett-Lowke, and they are secured to the deck by pins through a flange.

The funnels are aluminium tube 1½ ins. diameter, and each is fitted with two bands 1/32nd in. thick and about 1/16th in. deep. One is riveted at the top and the other, 1¼ ins. below the top, has hooks for the guy ropes and an eye to take the steam escape pipes, each of ⅛-in. brass tube. These pipes should have a mouthpiece fitted as shown. The funnels are secured to the aluminium plate by a light angle ring at the bottom riveted to the funnel at the proper distance from the top and a round taper pin bearing against a wooden ring as a distance-piece. Guy ropes fixed to rings secured to the lower of the two funnel bands and to the deck by shackles and deck plates should be fitted. The two funnels are also joined by a short length of guy. The shackles and plates are made out of thin brass sheet and fine wire.

The mast rigging should be done with fine cord, not too heavy. The funnels and mast must be at the same rake absolutely. The wood for the various deck-houses and shelters must, of course, have the grain running vertically and these should be varnished to give a teak effect. The mahogany handrail all round the main promenade deck and the upper deck is not more than 5/32nd in. wide by 1/16th in. thick and should be all in one piece on either side, steamed and bent to the line of the hull. The spacing for the stanchions must be most carefully done to ensure these being all truly vertical. A pair of dividers is necessary for this.

As already mentioned, the whole of the top deck with its lifeboats, davits and funnels lift off with that portion of the main deck over the accumulators. It is secured in position by two brass uprights screwed to the hull, passing through both decks and drilled near the top to take two pins. The stanchions which are spaced along either side just enter holes provided in the wood strip on the underside of the upper deck. The drawing illustrates the idea.

There is a railed-off space forward in which two stockless anchors are lashed to rests on the deck, a special davit for lifting and handling these anchors and a forward rudder tiller. This tiller is, of course, a dummy, but is fitted for correct detail.

The mast is stepped to a block screwed to the hull inside and is fitted with a small brass plate as a truck.

Jackstaffs are made out of brass rod and are fixed at the bow and stern.

A dummy capstan is fixed to the rudder stock with a pin and locking arrangement with quadrant to fix in any desired position.

The bollards and fairleads are pinned to the edge of the deck in the positions shown and they were made out of brass rod and sheet.

Stops should be fixed to the hull inside so that the position of the accumulators is always the same and no alteration in trim is made when they are replaced after recharging.

The painting and finishing has been done with Nobel's "Brushing Belco." This is an excellent covering, but the hull must, of course, be thoroughly sand-papered and rubbed down and then covered with a suitable undercoating. Carriage finish involves a lot of time and care, but for a good-class working model finish Belco will do very well. The colours are black hull from water-line up, white strake about ⅛ in. wide, and a red underbody. The saloon sides are all white, the funnels are buff with black tops, the decks clear varnished and the ventilators white outside and light blue inside.

It will be as well to give the inside of the hull where the accumulators stand a good coat of some acid-resisting paint or varnish, as there is always the possibility of some acid spilling and perishing the wood.

Student Engineers with the G.E. Co.

Two hundred and twenty-two men have been added to the test course at the Schenectady works of the General Electric Company of America since May, 1928. They represent colleges from the University of California to the University of Maine. Graduates of engineering or technical schools in South and Central America, Australia and Europe are also numbered among the newly enlisted young men.

In all, 522 student engineers representing nineteen nations and 114 technical schools are employed by the General Electric Company.

Representative engineers from England, France, Germany, Italy, Spain, Russia, China, Japan, India, New Zealand, Australia, Canada, Holland, Brazil, Chile, Mexico, Switzerland, Philippine Islands, and Cuba, are enrolled.

MODEL MARINE NOTES

Model Yacht Design.

XV—The Guiding Principles (Part IV).

By "Kappa."

(*Continued from page 590, vol. 59.*)

The first step in the design is to lay out the hull to any convenient size and adjust its shape so that it will sail. Then its size can be varied and the model redrawn to the desired length and weight by the employment of the rules already given.

On the other hand, the calculation of the size of the midship or master section in the first place will tie the designer and possibly cripple his work, as unless he knows fairly well the type that the model is to be eventually, he cannot determine the size of his master section at all with certainty. In the case in question it must not be forgotten that the model to be designed is to be of the dimensions given in the concluding paragraph of Article VIII.

If the designer knows what the form is like before he starts, then the following method of procedure has no point at all. If the designer does not know he should proceed as follows, remembering in the first place that a model cannot sail upright—she may so drift—by drawing the hull heeled to a comfortable angle and arranging for it to be able to sail in that position. As long as both sides are alike she will float upright and that position may be considered last of all. It is sometimes recommended that the first step is to draw in the profile of the model, but the beginner is earnestly requested to turn a deaf ear to such advice—as the profile will look after itself.

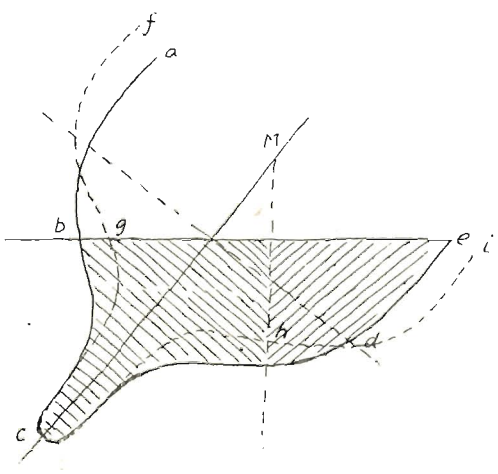


Fig. 1—The First Step: Fix the Position of M by Eye and Sketch a Master Section beneath it.

As it is undesirable that the beginner should design anything of the nature of a freak, it should at once be decided where the metacentre is to be.

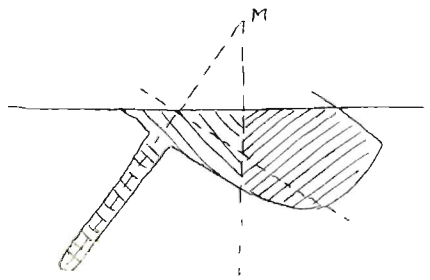


Fig. 2.—Beginners should Avoid this Type of Section as it involves Full Ends and Freakish Overhangs.

If it be below the water-line there is a tendency to a plank on edge, and if well above the deck to that of the flat skimming dish, so place it, say, midway between the two as a start off—say, three-quarters the height of the deck from the water-line, as in Fig. 1, and sketch in any midship section below it, say, *a b c d e*.

It evidently is useless as sketched, so try a modification *f g c h i* which looks more promising to the eye. Then cut out a paper pattern of *g c h d i*, crease it and balance it as in Fig. 36, Article XII, arranging that it balances under M. As the student gains experience, he will notice that there are several shapes which *g c h d i* can take, *e.g.*, Fig. 2, but for the present avoid extremes.

As pointed out in the previous article, the ends should be balanced slightly to the right of the line, and the choice must be made between round and vee ends. This is a very important matter to decide, which should not be settled arbitrarily as it introduces the question of length.

A vee-ended model may have a profile and quarter beam buttock of the general character

shown in Fig. 3, whereas the corresponding shapes of the round-ended craft are longer.

It has been laid down that the model is to be as long as possible, and that it is to be as easily driven as possible, or, in other words, it is to make waves as long and flat as possible, *vide* Article IV. But does the full-ended craft always win then? No, certainly not. Why? It is a question of wave length indicated in Fig. 4.

If a model be watched carefully, it will be noticed that the waves it makes in reasonably smooth water are always regular inasmuch as the waves in Fig. 5 are always spaced equidistantly apart and never like Fig. 6 as far as the writer has observed. Models appear to him to have roughly about five speeds, say, drifting, one-third wave length (very light airs), half wave length (light airs), ordinary single wave length (ordinary sailing breeze), long single wave length (running in a breeze).

The conditions intermediate between these lengths appear to be very unstable, the model being able to pass through one or more such positions before settling down to its speed or sticking at one of them when it becomes unsteady and drops back to the steady speed below it. Why is the expression steady speed used? Because a wave of any length, say, 2 ft., between crests will only travel at its natural speed which is governed purely by the distance between its crests just as under ordinary circumstances the time a pendulum takes to swing depends solely on the length of the string.

How can a short vee hull beat a larger round-ended craft then? Simply because the sailing conditions are such that it may be able to sail on its single wave length for example, in a breeze which is not sufficiently strong to drive the larger hull at its similar wave length, and the full-ended craft drops back to its half wave length, thereby appearing to be sluggish. If the breeze pipes up, the vee-end craft cannot go to its long wave speed with its steep waves possibly and therefore does not increase its speed appreciably, whereas the full-ended craft can develop its longer full wave length more easily with its flatter waves and she naturally leaves the shorter boat behind.

This is believed to be the true explanation as to how models appear to be so *fast* at times and yet sluggish at others.

It must not be thought, however, that because a model drops from a whole wave length to a half wave length that her speed is correspondingly halved or divided by three, as the case may be. The relative magnitudes of the speeds corresponding to these different wave lengths can be visualised by means of the geometrical diagram shown in Fig. 7, which can be drawn to any scale desired.

It is drawn for wave lengths up to 60 ins., the vertical ordinates giving the corresponding wave speeds and the following conclusions can at once be drawn, as it is obvious that the speed of the model and the speed of the waves it makes are the same.

A model making a 40-in. wave can hang on very well to one making a 50-in. one. If the breeze increases the little boat may be all out and, even in extremis perhaps, and the big one goes on unruffled and draws away gradually and steadily. If the breeze lightens the big boat cannot travel at the 50-in. wave length speed and she drops to that of 25-in. wave, but it may be sufficient to drive the 40-in. boat her full speed comfortably and then the short boat beats the big one. As is well known, it is nothing unusual for a small 10-metre model of say 36 ins. L.W.L., to outsail an A-class model in light airs, and hang on pretty well in light weather only to be lost the moment a sailing breeze springs up.

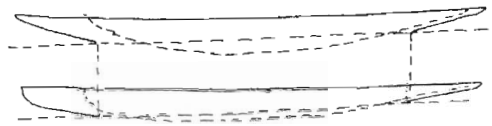


Fig. 3.—Vee Ends involve Short, Steep Buttocks, and Full Ends Longer and Flatter Lines.

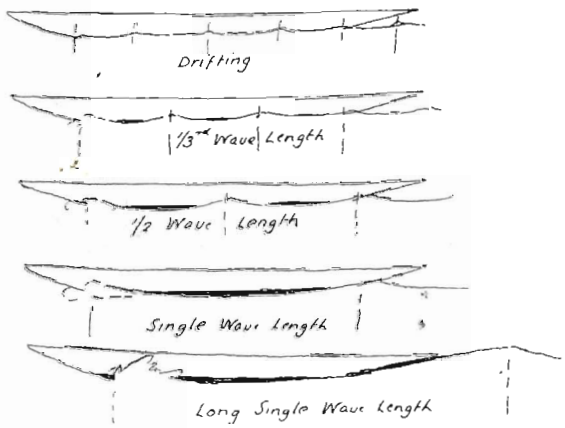


Fig 4.—Different Wave Systems: Five Speeds for a Model.

Space prevents further discussion on this point, and the reader is left to study the effects of the speed of models of different lengths sailing with different wave formations.

It is hoped, however, that it will be realised that as an ordinary breeze is a stiff one for a model, and still more so the smaller she becomes, it is advisable to go for length at all costs, as the breeze is generally sufficient to drive a model at the single wave length in an open pond.

In order to make the boat as easily driven as possible, it is advisable to turn Fig. 7 around so that if *oa* represents the height of the wave made, then *ab* represents the power lost in generating that wave. Similarly, for *oc* and *cd*, and flat waves are evidently essential if high

speeds are to be obtained as the power wasted increases so rapidly with the height.

Of course, all these notions can be upset by the fact that a little model sailing well will beat a model of almost any size sailing badly, and in any such generalisations it must be understood that in all comparisons each model is understood to be sailing well.

From these considerations, therefore, the designer can shape his ends. If he is unfettered by any rule, he must go for length, as do the

Fig. 5.—At a Steady Speed the Waves are Regular in Length.

Germans, where sail alone is measured. To design to a rule requires experience, and in this case he is reminded that the length of his model is to be the average of his L.W.L. and Q.B.L., which rightly or wrongly the writer considers may be as reasonable a method of taxing the length of a model without cramping the beginner's style as any.

Yet the question of length cannot be dismissed on the above considerations alone, as the effect of rough water must be considered.

The wave systems referred to so far are those generated or thrown up by the model, but those encountered on a pond are parts of many systems mixed together, the result being chaotic if they rebound from the sides of the pond. The only thing which can be stated as being probably true is the effect of their height. Just as the power to generate high waves increases very rapidly with the height, so must be the power required to burst through them or destroy them increase correspondingly.

In thinking then of sailing to windward against a sea, the diagram of the orange pip must be considered once more (Fig. 1, Article III). With the heavy increase to ahead motion, the squeeze between finger and thumb must be greatly increased. The sails must be brought down from aloft in order that they may be held against the strong finger pressure, and the thumb pressure must also be securely applied. These effects are obtained most readily by the adoption of flat-sided fins on a model

Fig. 6.—Irregular Spacing is seen when Speed is increased or decreased, but the conditions are unstable and unsteady.

which can be sailed reasonably upright. If the craft be over-canvassed, the heeled keel loses its absolutely essential grip for the thumb pressure and she slides away broadside on. This has been emphasised by the way A-class models, such as *Gertrude* from London and *Spur* from Greenock, held their wind in the A-class racing with their flat-sided fins of simple surface.

From these simple considerations it is evident that the model must be powerful in order that she may sail reasonably upright in a strong blow.

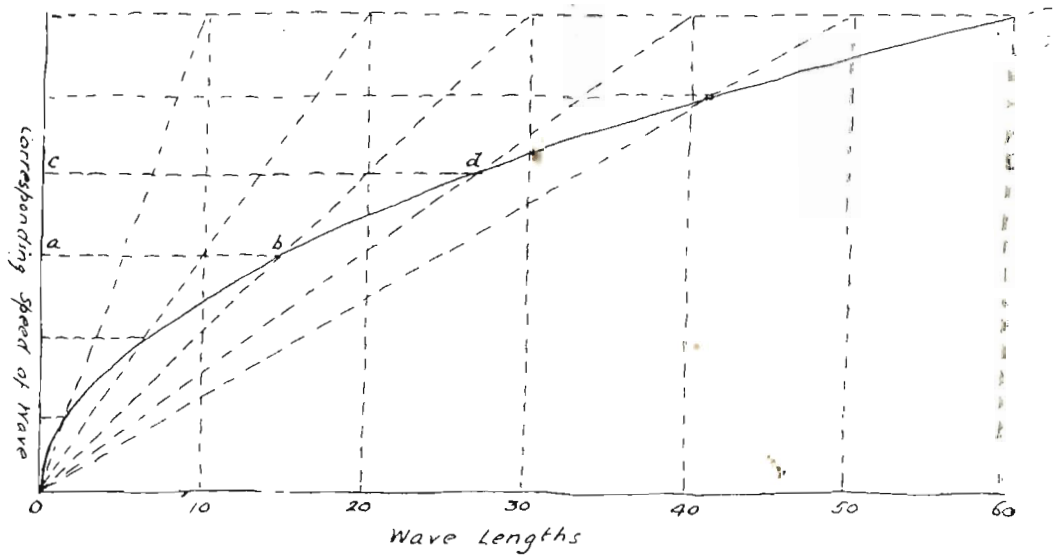


Fig. 7.—Speeds of Various Wave Lengths. An 80-inch wave travels at 4 land miles per hour.

The most suitable shape for sailing upright has been seen to be the skimming dish, which requires full bows for balancing. If the water be sheltered and smooth, the light-weight skimming dish can be very fast, but when the sea gets up, a heavy-weight skimming dish which can crash through a steep sea is desirable.

So why go to all this bother in order to design a model to sail on her side and then say, "Don't sail her on her side?"

It will be found in actual practice that as a model commences to pitch into a sea, a large wave is thrown to leeward from the lee bows or shoulders and little or nothing to windward. The effect of this is to lift up the bow towards the wind, and if she is sailing with the luff of the jib on the tremble, it will be seen that the jib tends to shake as her bow punches into the sea. It will be found in actual practice that with these disturbing punches under the lee bow accuracy of balance becomes of great importance in windward work in a sea-way—more so perhaps than in smooth water.

If the shaking is not sufficient to stop the boat by preventing the rest of the sails drawing a bluff bowed model can be extraordinarily close winded in a sea-way compared with a long sharp ended boat of the same general dimensions. The bluff bows mean a longer line under the bottom of the boat, so that when sheets are checked or eased she can be relied upon to look after herself on the reach or run, the general tendency of the full bluff ends being to make larger and flatter waves.

The effect of ample freeboard is marked in a sea-way. At first sight it involves a loss on account of windage, but the high side buried to leeward in the water adds not only to the finger pressure but to the thumb pressure as well. The writer can recall several occasions when heavy high-sided tubby craft have put up a show in broken water which made the lighter, longer craft with their decks in the water look a sorry sight indeed.

In lighter weather with the high freeboard out of the water there is nothing to compensate for the additional windage incurred, and any excess becomes an incumbrance. But as a general rule for sailing in rough water the model had better be too bluff forward than too sharp, as there are no apparent disadvantages in moderate weather; too heavy rather than too light, too much freeboard rather than too little, and too much beam rather than too little.

The orange pip tells one that reduction of head resistance is most important, so the spars should be brought down from aloft, and in this respect the tall masts for the jib-headed mainsails are a nuisance, which is only minimised or neutralised by the fact that the efficient shape of the sails allows a small sail plan to do the work of larger ones of other shapes. This thereby enables the saving in useless square inches of sail to be invested in a larger hull which provides the length, weight and power for rough weather when it becomes most difficult for a small craft to hang on to a bigger one.

As regards balancing a model for dead still smooth water and sailing her in rough water, which appears to be absurd on the face of it, it is noticeable that if a model heels over in smooth water when on her course, she does not alter course after making the waves or passing from one system to another, and except for the plunging effect referred to above the general effect on the hull is not noticeable, and it is believed to be not worth pursuing. Any effect is further minimised by the fact that the model is designed so that she can sail on her side without altering course and then arranging that she sails as upright as possible.

The model is bound to be pressed on her side at times in heavy weather, and she must then behave herself—neither run off nor luff. Furthermore, if the shelf on which the model leans is well and truly laid, then the driving power in the form of lead, lead, and still more lead, can be crammed into the model by the general reduction of other weights with great advantage.

The writer feels that he has been long-winded in drumming at these various features which his own experience convinces him are well worth studying, and it is now proposed to drop the further consideration of theoretical principles and discuss the shapes of the lateral plane and the longitudinal lines.

(To be continued.)

MODEL YACHTING NEWS.

By the Editor "The Model Yachtsman."

The 1929 season promises to be a record one both in this country and abroad. Naturally, the greatest interest centres in the doings of the A-class, and, large as the fleet is in this country, the States will have nearly as many boats afloat as we shall. There are already nearly a hundred of this class registered with the American M.Y.R.A., and we recently heard from Mr. John Black that over forty new ones were on the stocks this winter. In Germany also the class is making headway, and it is expected that the German Selection Races to determine that nation's representative for the International Races this coming summer will attract about a dozen entries. As Herr Rasmussen, the world-renowned Continental designer, and Herr Tiller, the crack German model yacht designer, will both be represented, Germany should be able to send over a pretty warm boat.

In this country about 130 boats are on the M.Y.A. register, and news is to hand of about forty or fifty craft building, so that things should be pretty lively here also. Mr. W. J. Daniels is constructing a new boat for himself, and she is one of the prettiest things we have yet seen under the rule. Several new boats are building from Mr. J. G. Feltwell's lines, some to a fin-

and-skeg design, and some to a full-keel design. We have heard rumours also of a new boat from Capt. A. Turner's board. Eng.-Captain Turner is one of the most original thinkers amongst model yacht designers, and a boat to his lines is always interesting and dangerous. Mr. A. W. Littlejohn, who has hitherto been well represented in the 18-footer class, in which he has scored so many successes, has now turned his attention to the A-class. *June*, built at Eastbourne to his lines, has proved a very likely craft, and we believe that there are several others building, so that we should hear more of him in this class in the near future.

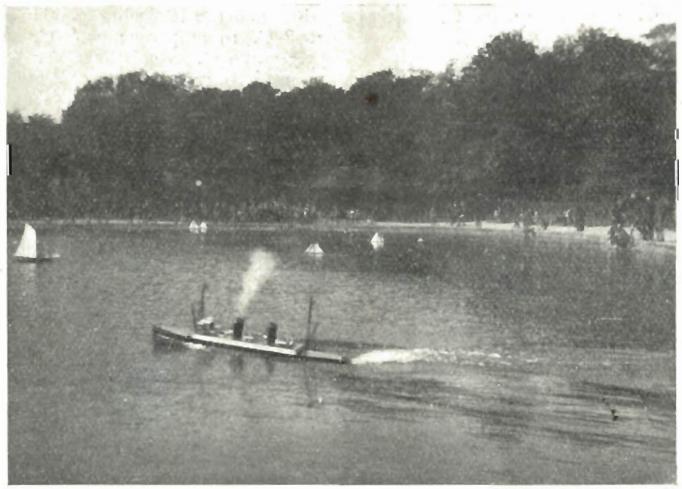
The decision of the I.Y.R.U. to retain the formula unchanged is a very wise decision, and for model yachtsmen as well as real yachtsmen the announcement has been greeted with relief. The feeling of uncertainty produced by the threat of changes was very bad for the sport and had a very adverse effect on building. In Scotland the small 6-metres (scale $1\frac{3}{8}$ ins. to ft.) has rapidly come into popular favour. This can be ascribed to the fact that these handy little boats suit the Scottish lakes very well and that really though much smaller than the 12's, they are intrinsically a better boat, owing to the fact that the 12's are rather short of draught. There is quite a likelihood also that the wee 6 may be selected as the International B-class, and if this is so, its popularity is assured. It has been suggested, however, that it is wrong to expect the model to do what the prototype does not do. The prototype is measured without her crew but sails with the crew aboard. The model is measured without crew and also sails without a crew or compensating weight. For a wee 6 the scale weight of a crew of five persons averaging 11 stones is 2 lbs. 2 ozs., roughly a tenth of the total weight of the model, so it can easily be seen that we are depriving our boats of a very large amount of stability.

Another interesting matter which is under discussion is the establishment of a 36-in. Restricted Class by the M.Y.A. for the use of juniors and for clubs sailing on waters which are not big enough to permit the use of the larger recognised classes.

An attempt is also being made to organise junior sections of model yacht clubs throughout the country, and in this the M.Y.A. have been fortunate enough to enlist the energies of Mr. G. Colman Green. Mr. Green was the founder and first hon. secretary to the Norfolk and Norwich M.Y.C. and has also another claim to fame in that he was the first person to endeavour to organise a National Authority in this country. In 1904 he founded the British M.Y.R.A., which came to an end about 1908 when Mr. Green was compelled to go abroad for business reasons. As the M.Y.A., which is the present National Authority in this country, is descended from the M.Y.R.A., founded in 1911, Mr. Colman Green's association was the first in the field by a number of years. By enlisting his services the M.Y.A. should benefit greatly, as Mr. Green has an inexhaustible fund of energy and enthusiasm as well as long experience of the sport.

The plans of the American representative (1928) *Patsy* were published in *The Model Yachtsman* (January issue), and an A-class design by Mr. W. J. Daniels is appearing in the February issue of the same periodical.

The excellent series of articles on design which "Kappa" is writing for THE MODEL ENGINEER has been followed by all model yacht designers with great interest. This series forms the best thing that has yet been published on the subject, and should find a place on every model yachtsman's bookshelf.



For description] [*see page* 68.

A Newsham Park Heavyweight: Mr. Sam Beale's New s.s. "Sapphire," N.M.P.B. Club.

QUERIES and REPLIES

Querists must comply with the Conditions and Rules given with the query Coupon in the Advertisement Page of each issue.

Selections from Queries recently replied to.

2673. Water Power.—P. E. F. (Andover).

Q.—I have a stream running at back of my place which is in my property. I should like, and have been trying to make use of this for power for driving a dynamo for battery charging. The stream is about 6 ft. wide and about 1 ft. deep, and at the particular place where I want to put my apparatus it is very fast running, but has only a fall of about 9 ins. I cannot head up more than this or I throw it back over a neighbour's garden. I made a wheel which is 1 ft. 4 ins. wide across vanes and about 2 ft. 3 ins. diameter. I then caged my water to this width, but I could not get sufficient power to get over the resistance of the dynamo and had to lose a lot of water to save flooding. I had this on the undershot principle and make up the speed by gearing. I wondered if I have the right type of wheel, whether it should be almost the width of stream and smaller to get more revolutions per minute? The speed the water travels appears that there should be sufficient power. The dynamo I have been trying is a Ford car type, new. Is this the right type or is there too much resistance in it?

A.—We doubt if you will obtain enough power by means of a water wheel, possibly a low-pressure turbine might be used, but we are not sure whether 9 in. is sufficient fall. Enquire of Messrs. Gilbert Gilkes and Co., Ltd., turbine makers, Kendal; or Messrs. J. J. Armfield & Co., Ltd., Ringwood, Hants. There is an article in THE MODEL ENGINEER of March 25, 1926, on "Small Efficient Water Power Plants in North Wales," which may be helpful. Also obtain from Rural Industries Bureau, 26, Eccleston Street, London, S.W.1, a pamphlet dealing with the subject of water power. Probably you could obtain a more efficient dynamo than one which has been designed for use on a motor-car. A water wheel depends upon the weight of the water flowing; as you have utilised the whole flow we do not see that you would obtain more power by using a wheel of greater width.

3071. Electric Vacuum Cleaners.—C. J. H. (Dorset).

Q.—Please give me dates of issues containing information on home-made electric vacuum cleaners.

A.—Notes bearing on electric vacuum cleaners appeared in our issues of February 12, 1925, August 25, 1927, May 16, 1928, and July 12, 1928.

3037. Resistance for Cutting Down 210 Volts Supply to 110 Volts.—A. S. (High Wycombe).

Q.—Can you tell me how much Eureka wire I will require to step down 210 volts D.C. to 110 volts D.C. and to pass a current of 2 amperes?

A.—As 200 watts will be absorbed by the resistance wire an appreciable amount of heat will be given out. If the wire can be wound open so that this heat can readily dissipate, you can use about 33½ yards of No. 23 gauge; but if the wire is in a confined space use about 50 yards of No. 22 gauge. The weights will be about 3 ozs. with No. 23 and 5¼ ozs. with No. 22. Wind up slightly in excess and adjust by trial until a length is found which allows the required current to flow. With any variation of amount of current the number of volts absorbed will vary accordingly.

3053. Articles on Transformers and Electrolytic Rectifiers.—T. J. (Coventry).

Q.—I intend making an accumulator charger. I understand I shall need a step-down transformer. I have some Stalloy stampings. Could you tell me the amount of wire, size, etc., for the winding of the primary and secondary.

A.—"Small Single-Phase Transformers," by E. T. Painton, price 2s. 9d., post free, gives rules for calculating sizes and windings and information about construction. The article on "Electrolytic Rectifiers" in THE MODEL ENGINEER of February 11, 1926, page 160, will perhaps help you. Also, that in the issue of December 15, 1927, page 563, "Making a Small Static Transformer," further reference to this is in the issue of June 28, 1928, page 612, with drawings.

3022. Resistances for Stage Arc Lamps.—J. T. (Ramsgate).

Q.—Could you please help me with the following: I wish to make up several resistances for stage arcs or limes, etc., in use four hours continuous nightly. The output of H.T. generator is 100 amperes 70 volts. I should like a fixed resistance for 12 or 15 amperes and about 45 or 50 volts at arc terminals. The G.E.C. supplied a coil of Eureka No. 11 resistance wire, and the following particulars: Eureka No. 11, 100° C. 19 amperes; 200° C. 30 amperes; 300° C. 35·5 amperes. Resistance per 1,000 yards at 60° C. = 156° F.; 63.7 ohms. Would it be possible for you to say how many yards are required.

A.—Eureka wire No. 11 gauge will comfortably carry a current of 17 to 20 amperes. If you like to use this wire, about 32 yards per lamp, that is, one separate resistance for each lamp, will be about the length for a current of about 12 amperes, somewhat less for 15 amperes. Otherwise use No. 12 gauge Eureka wire; this will comfortably carry 12 to 15 amperes. About 2½ lbs., or, say, 26 yards for each resistance. The only way is to make up a resistance, try it, and adjust the amount of wire until you get the working current desired. The amounts given are somewhat in excess of what you will probably find required and are based on 45 volts at the lamp terminals. You may find that about 50 volts will give best results if the current is to be 15 amperes. If there is a series coil in the lamp the resistance of this may slightly influence matters. Wind the wire into spiral springs and stretch them slightly open upon insulators mounted upon an iron frame. Of course, there will be heat given off by the resistance, this is unavoidable. Use bare wire.

PRACTICAL LETTERS from OUR READERS

Re Steam Engines.

DEAR SIR,—Further to our letter to you of December 14, would you be so good as to insert a note in your next issue saying that through your broadcasting our enquiries for small steam engines we have had many applications, and to save further correspondence will you please mention that we have been able to get into touch with two or three makers whom we are sure will be able to supply our wants.

The bulk of people we heard from were those in a small way who have a few machines, but you understand that such an enquiry as ours can only be dealt with on a basis of 12, 25 and 50 engines.

Thanking you once again.—Yours faithfully,

B. C. RHODES & Co.

An International Class for Model Petrol Speed Boats.

DEAR SIR,—First let me wish you all a Happy New Year; my wish for myself is to find in THE MODEL ENGINEER during 1929 some interesting descriptions of very fast power boats.

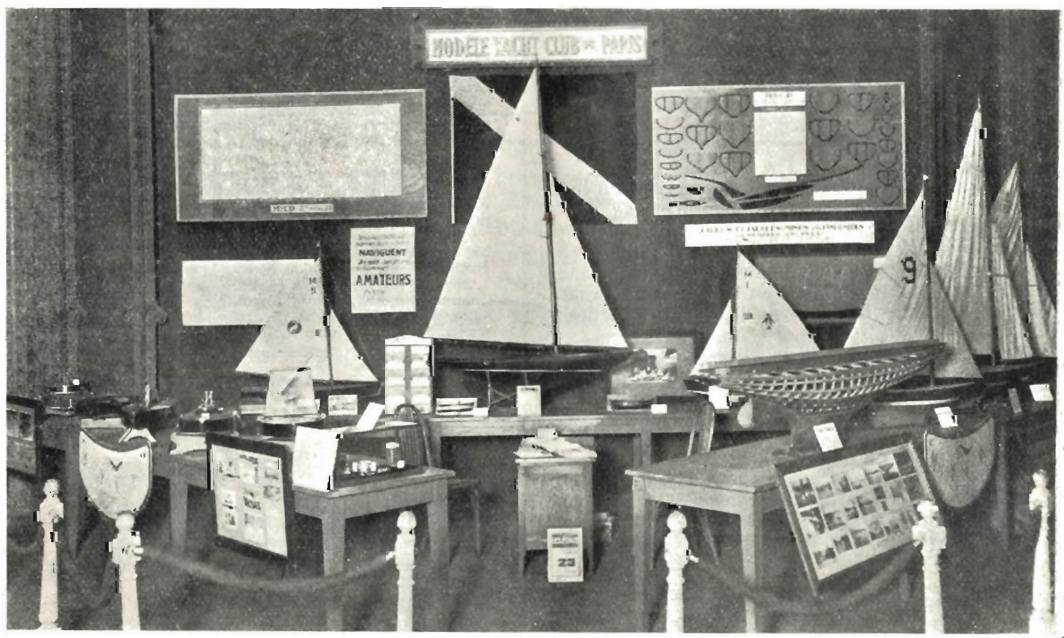
We have had in December, at the Grand Palais, an international marine exhibition which was very successful and very well attended. The Modele Yacht Club De Paris exhibited, and for your interest I send you photographs of the two sections of our stand. On one side there were model fishing boats and on the other both sailing and power racing boats. In between we displayed the panel of the French Federation of Model Yacht Clubs, giving the names of clubs at Bordeaux, Le Havre, Nantes, Nazarien, and Paris.

As regards motor boats, since I have mixed with English power boat men, that is, since 1925, I have never been able to discover any international basis of classification. Honestly, I do not think any has existed, and, in default, I have endeavoured to establish one in France based on my experiences at Victoria Park. In principle, this classification has been accepted for the past two years by our English friends. It is interesting to note that the fastest two boats on your side and on ours come within this class. It is as follows :—

Length = 1 metre (39.37 ins.) overall.
Beam = up to one-third of the length.
Displacement = up to 8 kilogrammes (17½ lbs.) in working order.
Motor = two or four-stroke.
Cylinder = maximum capacity 30 cubic centimetres (1.83 cu. ins.).

I would like this formula to receive official approval through your columns so that in future international contests some measure of uniformity may prevail among the competing boats. We all think over here that this classification will permit the building of very fast boats at the same time excluding the monstrosities fitted with motor-cycle engines.

For my own part I am certain that none of us has yet obtained the maximum power from the 30 cu. cm. cylinder, and the possibility of achieving



Some Marine Models at the International Marine Exhibition in Paris.

wonderful speeds is still before us. I venture to predict that the petrol motor which will give three-quarter brake h.p. from such a cylinder will enable the best speed records of flash steam boats to be equalled over a 500 yards run.

The classification we propose, which I am sure will meet the approval of the majority, will, however, not please everybody. There is nothing to prevent the creation of an "open" class as well, corresponding to the open classes for the large motor boats of from 1,000 to 1,500 h.p., which are also veritable monstrosities.—Yours truly,

G. M. SUZOR.

Paris.

INSTITUTIONS AND SOCIETIES.

The Society of Model and Experimental Engineers.

MEETINGS.—At Caxton Hall, Westminster, at 7 p.m. Thursday, January 24, lecture by H. E. Chubb, Esq., M.I.M.E., on "Locks, Safes and Strongrooms." This lecture will be of great interest and every member should make an effort to attend. Beginning with the primitive locks of the earliest ages, Mr. Chubb will pass on to those of the Romans, then those of the Middle Ages, and finally those of the present day. He will then deal with modern safes and strongrooms. The lecture will be illustrated with lantern slides.

COMPETITIONS.—The attention of members is specially drawn to the exceptional number of prizes being offered in various special competitions during this year. Particulars are being sent out with the handbook to all members.

WORKSHOP.—The fourth milling demonstration has been fixed for Monday, January 21. Those who have attended the earliest demonstrations know how extremely interesting they have been. Those who have missed them should make a special effort to attend the forthcoming one which promises to be more interesting than even the preceding ones.

Particulars of the Society and forms of application for membership may be obtained from the Secretary, R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

Institute of Patentees.

The following inventions have been received during the week ending January 5: Collapsible and non-collapsible furniture; improvements in or relating to water softening; an improved barrel tap; improved means for operating sliding sashes of windows and the like; an improved system for storing motor road vehicles and means for carrying same into practice; kitchen screen and dressing screen.

LECTURES.—A lecture will be given in the Caxton Hall, Westminster, London, S.W.1, on Thursday, January 31, at 8 p.m., on "Inventors, their Failings and Troubles."

Junior Institution of Engineers.

Friday, January 18, at 39, Victoria Street, S.W.1, at 7.30 p.m., ordinary meeting; paper, "Notes on the Fitting and Operation of Michell Bearings," by J. Foster Petree, A.M.I.Mech.E., A.M.I.N.A. (member); slides.

Edinburgh Society of Model Engineers.

A meeting will be held in the Board Room of the Philosophical Institution, 4, Queen Street (east end), on Tuesday, January 22, at 8 p.m., to discuss the question of a workshop, etc. Others interested who have not yet heard of the intention of forming a model engineering society for Edinburgh are cordially invited.

Hon. Secretary, A. GRIEVE, 70, Raeburn Place, Edinburgh.

Leicester Model Engineering Society.

NEXT MEETING.—January 18, 8 p.m., in Swiss Café, Welford Road; open night. Will members please bring as many models as possible.

Secretary, J. H. Riley, "Earlsdon," Scraptoft Road, Leicester.

Newsham Model Power Boat Club, Liverpool.

This club has had a good season's sport, and it is pleasant to be able to report that Mr. Sam Beale holds the blue riband of the lake this year with his new steamer *Sapphire* (see picture on page 65). This vessel proved a great success, particularly on target runs. Mr. J. Whelan, our Commodore, took second place, and then came Mr. F. Emerson (last year's winner) third, only one point behind the Commodore, which is very close running after eight rounds. The *Sapphire*, as will be seen by the photo, is of the liner class; length 6 ft., beam 10 ins., depth 7½ ins. Boiler: 13 ins. by 6½ ins., flue 3 ins., with eleven ½-in. cross tubes, all of copper, riveted; working pressure 90 lbs. The engine is 13/16th-in. bore, 1-in. stroke, twin-cylinder, double-acting. The whole job is fine workmanship. The outer fittings consist of bridge, boats, ventilators, etc., and she is a credit to the fleet to which she belongs. The Club invites anyone interested in power boats to add another to the fleet.

Hon. Secretary, G. MANNING, 106, White Rock Street, Liverpool.

Notice.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. 8d., post free to all parts of the world.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 66, Farringdon Street, London, E.C.4.

Sole Agents for United States, Canada and Mexico: Spon and Chamberlain, 120, Liberty Street, New York, U.S.A., to whom all subscriptions from these countries should be addressed. Single copies, 14 cents; annual subscription, 5 dollars 50 cents, post free.

Contents.

The asterisk (*) denotes that the subject is illustrated.

SALES AND WANTS

EVERYBODY'S MARKET

ENGINEERING & SCIENTIFIC ELECTRICAL GOODS

Advertisements are inserted in these columns at the rate of **One Penny** *per word—minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

Advertisers who wish to separate *their announcements into distinct paragraphs must have not less than 12 words in any one paragraph, followed by the word "Below"—which is charged for.*

"Box" Replies *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box ——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address.)* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box ——, "The Model Engineer," 66, Farringdon Street, London, E.C.4.*

All advertisements in these columns must be prepaid, *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 66, Farringdon Street, London, E.C.4.*

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—

General, Models, Wireless, Motoring.
Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Central 9071.*

OUR DEPOSIT SYSTEM.

We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 66, Farringdon Street, London, E.C.4. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the deposit must be sent either by Postal Order or Registered Letter. **(Cheques cannot be accepted.)**

The fee mentioned above should be sent in Stamps or by Postal Order as a separate amount.

In cases of exchange, money to the value of the article should be deposited by each party. **We cannot receive the articles themselves.**

General

Watch Jobbers.—Our 5s. Box of Replacement Parts of Watches saves you pounds; sample 1s. Send stamp for illustrated lists. Watch repairs guaranteed. All parcels insured to full value.—BLAKISTON, Ainsdale, Southport

B.A. Screws, Nuts, Washers, assorted gross 2s., list 2d.; small Whitworth Screws, assorted gross, brass 3s., steel 2s. 6d.; trade supplied.—J. H. BENNETT, Station Road, Willesden Junction.

Mechanics' Overalls at Pre-War Prices. 2s. 11d., strong blue or brown drill. Washing and wear guaranteed. Direct from factory at makers' prices. A p.c. brings patterns, inch tape and self-measurement chart.—CURREY & Co. (Dept. B.), 9, John Street, Thomas Street, Manchester.

Screws, Nuts, Washers. List free.—EDWARD EMPSALL, Trentham Place, Dewsbury Road, Leeds.

Files.—Recuts, English, 8—12", assorted dozen 5s.; Hand Drills, single, ⅜", 3s. 6d.—Below.

Wirestrainers, aero, steel, small, dozen 1s. 6d.; 25-lb. Pressure Gauges, 5s. 6d.; Radiator Thermometers, dashboard, 10s. 6d.; Cross Levels, 1s. 9d.—Below.

Hydrometers, glass, various ranges, 9d.; Trench Periscopes, complete, cased, 2s. 3d.; Aluminium Pulleys, 3½", 8d.—Below.

Grinders, hand, bench, 4×1, 9s. 3d.; Vices, Parkinson's "Handy," width 2½", 8s. 6d.—Below.

Canvas Bags, new, cycle, 18×5", 5d.; Aluminium Cigarette Cases, 5d.; 12" Wood Propellers, 1s. 4d. —Below.

Free List Tools, Ball Races, Instruments, etc.—COLEY, LTD., Ordnance Works, Queen Elizabeth Road, Kingston-on-Thames. ('Phone 0365.)

Oxy-Acetylene Welding Pays!!—"Ajax" Plants soon return costs.—GREENWOOD, Arnside Road, Southport.

Wanted.—Electric Lighting Sets, petrol, oil or steam; Small-powered Engines or Model Locos. Full particulars and lowest price for spot cash.—62, Holly Lane, Smethwick, Staffs.

1,000 Billheads, 4s. 6d.; all Printing cheap; samples free.—ECONOMIC PRESS, Branksome, Bournemouth.

Surveyor's Prismatic Compasses, two, by Hicks, 2½", with card dials, in sling leather cases, 12s. 6d. each.—GENTRY, 66, Farringdon Street, London, E.C.4.

Rare "Model Engineer" Volumes, going at less than present market price: Vol. I, £3; Vol. II, £2; Vol. III, £1 10s.; or £6 the set, carriage paid; all perfectly new, and in publishers' bindings; a great opportunity to acquire earliest numbers. Apply without delay, please.—Below.

"Model Railway News" Volumes. Vol. 1 (very rare) 25s.; Vol. 2, 7s. 6d. or 30s. both. Perfectly new condition, publishers' bindings; (London district).—Write, Box 1135, MODEL ENGINEER Offices.

When communicating

—with Advertisers our readers will avoid delay if they will kindly

state requirements clearly

—whether ordering goods or merely sending an inquiry. A stamp should be enclosed when asking for lists or particulars.

Prompt Repairs (or spare parts supplied) to Watches, Clocks, Jewellery, Optics, Gramophones. Wheel-cutting undertaken. Price Lists: New Watches, Clocks and Cutlery, 6d.; Repair Charges, 3d.; Material and Tool Catalogue, 1s. 9d. (overseas excluded).—YOUNG & SON, Material Dealers, Chippenham, Wilts.

"Wood Toymaking." A practical handbook with 180 illustrations of effective toys; 1s. 6d. posted.—"INDUSTRIES," 13, Gordon Avenue, Twickenham.

Enlarge Your Drawings Mechanically with a "Perfect" Pantograph. Oak, brass fitments. Boxed with instructions. Approval 2s. 6d.—"INDUSTRIES," 13, Gordon Avenue, Twickenham.

70 Large Brazing Lamps, 4-pint, 14"—18" flame, petrol, benzine or petroleum; honestly worth £3 10s.; special offer to clear, 37s. 6d.—HILLIER, 225a, Station Road, Harrow.

6" Bench Grinders, hand, machine-cut gears, totally enclosed, actual value 15s., 36 to be cleared at 6s. 11d.—HILLIER, 225a, Station Road, Harrow.

Repairs, Electrical (A.C. or D.C.) or Mechanical, large or small; best workmanship; reasonable charges.—SALLIS, Mayfield Grove, Nottingham.

1s. Any Lot, Post Free.—1,000 Model-maker's Rivets; 500 larger Rivets; 200 small Screws, Nuts, Washers; 72 Taper Pins; 500 small Steel Washers; 6 Assorted Punches; 12 best quality Twist Drills; 20 small Twist Drills; 6 various Files; 12 Hacksaw Blades; 1 Patent Emery Cloth Holder; 1 Radius, Thread or Wire Gauge; 24 Brass Wing Nuts; 50 Shackle Pins; 5,000 Assorted Tacks; 12 ft. Silver Steel, assorted; ½ oz. Silver Solder.—BROOKS, Engineers, Poulton-le-Fylde.

Cheap Printing.—1,000 Billheads, 3s. 6d.; samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

Ball-bearing Races, slight imperfections, satisfactory, usable, Hoffmann, Skefko, ¼", ⅜", 10 mm., 15 mm. bores, 6d. pair, 3d. postage; 1½" bores, 9d., plus 5d. List sent.—18, Galton Street, Smethwick.

The 20s. Boiler.—We have been snowed under with orders for this remarkable Boiler. We apologise to those customers, in this country, the Dominions and America, whom we have had to keep waiting. We have put down special plant for the rapid production of the 20s. boiler so that quick deliveries are now assured. The specification of the boiler is as follows:—Welded steel Gas-fired V.C.F. Boiler, 5½" diam. by 11" high; shell and firebox rolled to shape from best 14 gauge steel; firebox entirely surrounded by water and fitted with our special "Express" circulating coil, promoting rapid steaming; an efficient superheater and gas burner is provided; steel pads welded on boiler shell to take fittings; tested hydraulically to 200 lb.; working steam pressure 100 lb.; weight 18 lb. Carriage 1s. 9d. extra.—R. H. BOLSOVER, Eaglescliffe.

£2. Bargain.—One only, 15-volt 150-watt Peto-Radford Dynamo, perfect condition, complete, speed governing pulley, voltmeter, ampmeter. Several 6-volt and 12-volt Machines from 15s.—Below.

£4.—Small 4-cylinder Water-cooled Engine, complete, magneto, carburettor, tanks, ideal workshop or boat.—COLEMAN, Willingale, Ongar, Essex.

"Iron-Steel-Cement," repairs wrought or cast iron. Tins 1s. 3d., 2s. 6d., 4s. 6d., 6s. 6d. posted —ALBERT FEATHER, White Abbey Road, Bradford, Yorkshire.

"General" (*Contd.*)

Price Tells! Price Tells!!—Butler's Model Petrol, Gas or Paraffin Engine Castings, partly machined, are wonderful at 9s. 9d. a set, including 2- and 4-stroke, yet as practical as 100 b.-p. They suit every mechanic with a light purse. Catalogue 3d.—Below.

Now Here's a Bargain for Someone.—42" Power Circular Sawbench, admit 30", at £4 19s. 6d., with saw. Where can you do better if starting a firewood business.—Below.

Here's a Knockout Machine waiting to be bought. Whitton Ring-oiling Cage-type Dynamo, Generator or Motor, charge comfortably 50 batteries. Is it cheap? Oh! yes, £3 19s. 6d.—Below.

And Lastly, a smart Hopper-cooled Horizontal Petrol or Gas Engine, ¾ to 1 h.-p., by Robinson, electric ignition, and £4 19s. 6d. secures it.—BUTLER'S GARAGE, Littleover, Derby.

Here's a Real Genuine Bargain.—Three-valve Sets, in handsome polished oak or mahogany cabinet, including valves, 72s. Every set fully guaranteed.—Inquiries, "WIRELESS," 48, Stopford Road, Plaistow.

Transfer Graining Papers. All woods. Six large sheets with directions, 1s. 9d. Oak, walnut, rosewood, maple, mahogany.—INDUSTRIES, 18, Gordon Avenue, Twickenham.

"Model Steam Engines," by Rev. J. Shores, 67 illustrations and complete story (2s. 6d.), only 40 in stock; to clear 1s., post paid.—ANDREW REID & Co., LTD., Publishers, Newcastle-on-Tyne.

Universal Bargains.—Exceptionally substantial Electric Lighting and Charging Installation, comprising 6 to 8 h.-p. stationary type engine, fitted with high-tension trigger magneto, Zenith carburettor and fuel tank, and including water-cooling tank, and silencer and pulley; driving totally-enclosed genuine G.E.C. shunt-wound dynamo, approx. 110 volts 25 amps.; taken straight from work, and a very dependable installation indeed; an ideal installation for country house, workshop, or garage; great sacrifice £25, delivered free on rails at Derby; running inspection invited.—UNIVERSAL MOTORS, James' Road, Derby.

Gauge 0 Steam Loco, tender, carriages, signals, 50 ft. rail, £2; Gauge 2½" Loco, tender, ¾"×1½" cylinders, slide valve, rails, £2; exchange English Concertina.—BUCK, 13, Oldfield Road, Rotherhithe, London.

Nine-valve Super-Het. Receiver, mahoganite panels, cabinet, Osram valves, Big Amplion speaker, 120-volt Exide accumulator, also L.T. 2-frame aerials, H.T. and L.T. battery charger, complete, as new, £15 or near offer; cost over £60.—ACE ENGINEERING, 20, Bucklersbury, London, E.C.4.

3½ h.-p. Brand New Side-valve Air-cooled J.A.P., single cylinder, complete M.L. magneto, £8 10s.—ACE ENGINEERING, 20, Bucklersbury, London, E.C.4.

Compound Microscope, complete with accessories, £3.—Seen 41, Wavertree Road, Streatham Hill.

Typewriter (Underwood), visible writing, brief carriage, tabulator, absolutely perfect, £8; exchange for good Treadle Lathe.—L. WAKEFIELD, Parade, Birmingham.

Clearing Hobby Room Accumulation of Years.—15 Telephones, various, 50s. lot; 3 Speedometers, £1; "Euk" Easy Starter, new, 5s.; Polishing Head, heavy, 5s.; Gestetner Flat Duplicator, £1; Polygraph and Type, 15s.; Typewriter, 15s.; small Electric Motors, A.C. and D.C., large compass, in oak case, 15s.; Switches, Resistances, Tools; Copying Press, 5s.; Magnavox Loud-speaker; Wheatstone Bridge, 5s.; Ozonair Apparatus, Addressing Machine, Chemical Balance (Oertling), Mascots; Electric Radiator, 220 volts, £1; A.C. Motor Carrier, good condition, £12; Oddments, Pressure Gauges, Motor and Cycle Lamps; Post Card Projector, new, £1; Aeroplane Pumps, Exide Accumulators; Edison Dictating Machine, £1; Wireless Parts, Any price clear. Call before 7 o'clock, except Thursday.—"F.," 24, New Cut, S.E.1.

Free.—Pocket Rubber Stamp of your Name and Address; also particulars of Money-making Spare Time Work.—H. RICHFORD, Snow Hill, London.

Vols. 56, 58, 59 "M.E.," 12s. 6d. lot; Telescope, by Fields, with sling case, 25s.—112, Middle Street, Deal.

Voltalite Cycle Dynamo and Headlight, 5s.; pair Runner Skates, thin blades, 5s.—BEVIS, Linford, Stanford-le-Hope, Essex.

Ball Bearings, best English manufacture, ¼" bore by ½" outside by ¼" wide, 1s. 10d.; ⅜"×⅝"×¼", 2s. 1d.; ½"×1⅛"×¼", 2s. 3d.; ⅝"×1⅜"×5/16", 2s. 7d.; ¾"×1⅝"×5/16", 2s. 11d. each; all sizes.—STANDARD MODEL CO., 224, Rochdale Road, Halifax.

Home Cinematography.

Cinematograph Films and cheap British-made Machines, Accessories; list free—"FILMERIES," 57, Lancaster Road, Leytonstone, London.

"Working Your Home Cinema." Valuable information. Also bargain lists, Films, Machines, Film Library. Postage 2d.—"WAYLAND," 109 Kenlor, Tooting, London.

Cinematograph Films bought, sold and exchanged; stamp for particulars.—ED. BURLEY, 21, Jardine Road, Aston Manor, Birmingham.

Home Cinematograph, takes full-size reels, super lens, 37s.; also Films.—1, Windmill Lane, Stratford.

Oxford Portable Cinematograph, perfect, cost £35, accept £5 10s.—72, Glenthorne Road, Hammersmith.

Cinematograph Machine (Gaumont) and stand, £7; sale, or exchange Lathe; entertain anything Mechanical.—C. J. CARR, 92, Shacklewell Lane, Hackney, E.8.

Boilers in Steel or Copper, all types and sizes; Locomotive Boilers from ¾" scale made to fit your frames, flanged plates; supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

Model Yachts. Build your own. Complete Set of Parts, 5s. Send 3d. stamps for plan and full instructions.—CAPRI MODEL YACHT WORKS, Church Walks, Llandudno.

Railway Accessories.—"O" Brick Platelayers' Huts, 7s. 6d., post free.—R. BIRD, "Radnor," Montrose Avenue, Luton.

Three Crankshafts, balanced cranks, suit model traction engines; 3 Injectors (one vertical), three sizes; 6" Cast-iron Flywheel, with eccentric sheave turned solid on wheel, with strap and rod one ½" diam. Trunk Plunger Feed Pump; one Double-cock Cylinder Lubricator, 1¼" overall; all by Bassett-Lowke, and brand new; 75s. the lot.—PAGE, The Bungalow, Ifield Park, Crawley.

Gauge 1 Clockwork Locos, coaches, trucks, Simpull track.—Write particulars, 81, Rosebery Road, N.10.

Stuart B.B. Engine, 30s.; Simplex, £1; also Star, 15s.; all with displacement lubricators; any of the above suitable for metre speed boats.—W. TURNER, 36, Commercial Road, Lambeth, London, S.E.1.

Fine Model Racing Yacht, professionally built, in perfect condition, length 4 ft. 6", beam 10½", mast 5 ft. 4", carvel planking, Braine steering, £4 10s.; photo sent, 3d.; or can be seen.—MAW, Mowbray Avenue, Exeter.

Gauge 1 G.N.R. Railway for sale, 120 ft. steel track, 4 points, Bassett-Lowke steam Atlantic and clockwork 0—6—2 tank, 6 wood wagons and 2 tinplate, 1 wood corridor coach, scale signals.—Apply, A. F. GIBSON, 60, Becmead Avenue, London, S.W.16.

Racing Schooner, 5-footer, Braine's steering, as the well-known "Prospero," complete, £12; or exchange small Solo Motor Cycle.—CASTLE, Glengarry, West Ayton, Yorks.

Solid-drawn Copper Tubing, 10×4½×1/16", 4s. 6d. per length.—SHARPLES, 6, Peter Street, Blackburn.

Horizontal Engine, 1"×1", £2 15s.; Vertical Compound Engine, ⅜"×⅜", £3 10s.; Horizontal Reversing Engine, ⅜"×1¼", £2 17s.; Slide-valve Type. What offers?—J. HULME, 51, Peter Street, Blackburn.

Twin-cylinder Gun-metal Marine Engine, ¾"×1", suit 4-ft. to 6-ft. boat, 35s.; also Heavy Riveted Copper Horizontal Boiler, tested 100 lb., 11"×6", 3-ft. firebox, 3 cross tubes, 7 horizontal, for blow-lamp, less fittings, 15s.—SHAW, Avenue Road, Wolverhampton.

Model Railway, 2½" gauge, about 56 yards track on sleepers, points, crossings (electrical control), engine shed, goods depot (crane), platform, waiting room, booking office, signal cabin (electrical control), water tower, 2 switch cabins, 3 signals, loading gauge; 4—6—0 Steam Tender Loco, Joy's gear, oil fired; 2—6—2 Steam Tank Loco, slip gear, spirit fired; Goods Rolling Stock, 5 open trucks, 2 brake vans, cement wagon, double-bogie covered wagon; £45.—C. H. JONES, 11, Tothill Street, London, S.W.1.

Seamless Brass Tube, 2¾" diam., 9" long, ⅛" thick, 8s. 6d.—FOULSTON, Bunyan Road, Kempston, Beds.

Wet H.T. Batteries, easy to build, long life, constant output, self-charging. Parts per dozen: Jars, 2½×1½ square, 1s. 3d.; Zincs, 11d.; Sacs, 1s. 2d. doz.; dozen Cells (18 volts), complete with bands and electrolyte, 4s. 3d., post 9d.; Sample Unit, 6d. Illustrated booklet free. Wireless list free. Amplifiers, 19s.; Two-valve Sets, £4.—L. TAYLOR, 57, Studley Road, Stockwell, London.

Loud-speakers.—Fuller Sparta "Junior," 55s. model, brand new and guaranteed, bankrupt stock, clearing at 21s. each; 7 days' approval allowed against cash.—MAUDES, 58, Praed Street, W.

Accumulators, best quality, cheapest anywhere.—HAYNES, rear 847, Old Kent Road, S.E.15.

Brown's Microphone Amplifier, perfect condition, for use with crystal or valve set; cost £5 15s.; sell £2 10s.—Maw, Mowbray Avenue, Exeter.

Nine-valve Super-Het. Receiver, mahoganite panels, cabinet, Osram valve, Big Amplion speaker, 120-volt Exide accumulator, also L.T. 2 frame aerials, H.T. and L.T. battery charger, complete, as new, £15 or near offer; cost over £60.—ACE ENGINEERING, 20, Bucklersbury, E.C.4.

Highly Sensitive Microphones, for radio amplifiers, etc. See "Electrical" column.—FREDK. ADOLPH.

Genuine Mazda Bulbs, 12 volts 6 watts, double contact, two for 1s. 6d., post free; trade supplied.—Below.

Portable Adjustable Engine Stands, from £3.—COLE, Milo Garage, Milo Road, East Dulwich, S.E.22.

Foot Pumps, heavy, folding, brand new, will inflate 6" tyre easily, usually 21s., special offer 9s. 11d., post 1s.—HILLIER, 225a, Station Road, Harrow.

Morgan, very sporty, £25; 6 h.-p. O.H.V. Combination, one owner, £16. Wanted, 3½ Douglas.—5, Cliff Street, Liverpool.

2½ h.-p. Two-stroke Levis, 1924, all chain, 3 speeds, mechanical oiling, bargain £13 10s.—11, Feversham Terrace, Ferryhill, Co. Durham.

1920 10 h.-p. Swift Chassis, Engine, Gear-box, etc., in good order; back axle requires attention. What offers? Exchange Machine Tools.—WM. PEMBERTON, 82, Magdalen Road, Oxford.

Lemmon's Bargains.—Magnetos from 10s.; H.F. Baby Vulcaniser, £3; Dynamos from 25s.; Motor Cycle Engines, Parts, Singer Car Parts, Accumulators, Ball Races, Tools, etc. Stamp for list.—ENGINEERING WORKS, South Street, off Sackville Street, Southsea.

4 h.-p. Triumph Combination, 1919, reconditioned; 1922 Gloria Touring Sidecar, chain-cum-belt, not taxed, £10; 1922 2¾ h.-p. Two-stroke Connaught, 3 speeds, K.S., taxed, insured, fully equipped, Tan-Sad, £10.—BEVIS, Linford, Stanford-le-Hope, Essex.

Ball Bearings.—Roller Bearings in stock for any make of car, lorry or cycle, inch or metric.—STANDARD MODEL CO., 224, Rochdale Road, Halifax.

LIGHT MACHINERY Sales and Wants

Tools

Lathes.—Britannia, C.A.V., Drummond, Edgar, Eta, Exe, Milnes, Patrick, Wade, and all leading makes in stock.—BUCK & RYAN, 310-312, Euston Road, London.

Lathes, standard makes, easy terms; lists free.—Machinery Dept., J. G. GRAVES, LTD., Sheffield.

Six Various Reamers, 3s.; 6 various Milling Cutters, 4s. 6d.; "Athol" 3" Inside Spring Nut Callipers, 2s. 6d.; 6 High-speed Chasers, 2s. 6d.; 2½" Toolmakers' Cramps, 1s. 6d.; 10s. orders carr. paid.—BROOKS, Engineers, Poulton-le-Fylde.

You Needn't Take Risks! In 1907 we started making Chucks for *M.E.* readers, and, having stood the test of time, we're still going strong. We supply most leading lathe makers. Chucks sent on approval against cash.—Below.

Independent Chucks! Light model, having four reversible hardened steel jaws, square thread screws. Specially designed to screw direct on to Drummond, Britannia and other light lathes, saving overhang, and weight and expense of backplates. Price: 3½" Chucks, 29s. 6d.; 4½", 33s.; 6", 39s.; 7½", 48s. 6d. Carriage paid. If screwed to fit lathe, 3s. 6d. extra. Larger sizes same style up to 18".—Below.

Chucks! Chucks! Self-centring Chucks, Drill Chucks, Independent Chucks. All sizes up to 30" diam. 5,000 in stock! Write us before buying elsewhere.—Below.

Three-speed Treadle Motors for driving any make of lathe. Ball-bearing Flywheels, 55s.; Plain Bearings, 45s.—STERLING CHUCK CO., Cobden Street, Bradford.

Heavy Mechanics' Vices, plain type, 4", weight 44 lb., 27s. 6d.; 6", weight 119 lb., 47s. 6d.; ditto, cheaper quality, 3", 7s. 11d.—HILLIER, 225a, Station Road, Harrow.

Milling Attachments for Lathe, Dividing Mechanisms, Combination Woodworkers. Experimental work and models to order.—WHEELER CO., LTD., Trench, Wellington, Shropshire.

4" Drummond Lathe, on stand, with treadle, £6; with 4" S.C. Chuck and dozen Tools, £7. Seen by appointment.—41, Wavertree Road, Streatham Hill.

Small Fly Press, 20s.; 4½" Lathe Head, 6s.; Slide-rest, 7s. 6d.; Foot Motor, 10s. 6d.; Manchester Dynamo, 4½" armature, 20s.—THORPE, 144, Gloucester Road, N.W.1.

Liquidated Stocks. Genuine Bargains.—350 Sets of five genuine Bodmann Crescent pattern Adjustable Wrenches, hardened and polished, 4" to 12", 10s. 6d. set, postage 9d.; 150 genuine Bodmann Bolt Cutters, highest grade tool steel jaws, cutting capacity ⅜", ½", ⅝"; price, 18" 4s. 9d., 24" 7s. 6d., 30" 15s.; 200 genuine Bodmann Stillson pattern Wrenches, unbreakable steel, 18" 5s. 6d., 24" 7s. 6d., 36" 12s.; gripping capacity 2", 3", 3½"; 65 genuine Ixion Two-speed Breast Drills, with Morse taper spindle and ½" chuck, cut steel gears, enclosed in case, price 12s. 6d.; 30 Ixion Bench Drilling Machines, automatic feed and release, hand feed regulator, 2 speeds, ball bearings, enclosed gears, electro steel, machine cut, 3-jaw chuck, ½" capacity, 37s. 6d.; 75 Sets "Little Giant" pattern Stocks and Dies, in polished case, with colletts, ¼" to ½" by 1/16", complete with stocks and adjustable tap wrench, mockled, guaranteed, Whitworth or B.S.F., 3 taps to each size, 42s. 6d. set; combined set, 78s. 6d.; 400 gross Assorted Twist Drills, from 1/16" to ½", highest quality, guaranteed, 24s. gross, ½ gross 13s.—Below.

Goods Delivered Without Delay on approval against cash or deposit with MODEL ENGINEER. Carriage paid £5 orders.—HOLMES, Tool Merchants, Leeds Road, Bradford. (Established over 30 years.)

Middleton.—Capital little Bench Lathe, 6½" centre, 30" bed, 4 speeds, headstock, compound swivelling and graduated slide-rest, wheel-feed poppet, 58s.

Middleton.—Brand new small High-pressure Gas-fired Hardening Furnace (Winn), on tray, real bargain 27s.

Middleton.—Slide-rests, 5" and 7", compound swivelling, graduated, 19s. 6d. and 22s. 6d. each; Crocodile Shears, 6" blade 7s. 6d., 8", 9s. 6d.; Lathe Carriers, 8s. doz., assorted to 5"; Capstam Lathe Slide, 5", automatic revolving turret for 6 tools, 19s.; practically new; all carriage extra; Tool Steel, ¾" square, 12-ft. lengths, 1s. 4d.; Whit. Internal and External Chasers, all threads, 3s. 3d. doz.

Middleton.—Screw-cutting Lathe, 8-ft. bed, 6½" centre, back-geared, C.S. and G. slide-rest, wheel poppet, complete faceplate and countershaft, must clear, £5 15s.

Screw-cutting Lathe (Taylor), 6½" centre, 6-ft. bed, back-geared, with tumbler reverse, slotted boring saddle, C.S. and G. slide-rest, in beautiful condition throughout, complete countershaft, change wheels, faceplate, catch-plate, centres, £9 15s.; genuine bargain.—MIDDLETON & Co., Hazelwell Street, Stirchley, Birmingham.

3" to 4½" Back-geared Screw-cutting Bench Lathes, gap beds; quality, reliability.—SAUNDERS, 4, Anerley Station Road, S.E.

Barnes 4½" Lathe, with self-centring, independent and other chucks, change wheels, many tools; stock of Steel and Brass; all in excellent order; £13, bargain.—Box 1147, MODEL ENGINEER Offices.

Lovely Little Lathe, by James Archdale, 6" centre, 5-ft. gap bed, screw-cutting, self-acting, sliding and surfacing, and back-geared, with countershaft, turret-type toolholder, and tee-slotted saddle; rare garage lathe; £14 10s.; great sacrifice.—UNIVERSAL MOTORS, James' Road, Derby.

Drummond 3½" Lathe and Accessories for sale, Model Hand Planer (Norvic), 9" stroke, as new. Wanted, Circular Wood Planer, 9" cutter, and Electric Motor, 2 h.-p., 210 volts, alternating.—PARTRIDGE, "Southwood," Edward Road, Bromley, Kent.

All-Steel Wood Chisels, a new Sheffield production, warranted, ¾", ½", ⅝", ¾", 2s. 9d. set; sample 9d.—S. HIBBERD, Ash Street, Sheffield.

On Account of Our Manufacturing high-grade Cold Chisels, Wood Chisels, etc., we are clearing our surplus stock of Tools, etc., at 20% below cost. List now ready.—Above.

Compound Slide-rests swivelling, best quality, every size; lists, stamp.—GEO. GOODMAN & Co., Engineers, St. James', Bristol.

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Brownie 3½" Bench Lathes, 25s.; Foot Treadles, 35s.; Compound Rests, 15s.; stamp, particulars.—BROWN, Pleck, Accrington.

3½" Drummond B.G. Screw-cutting Lathe, on stand with treadle; ditto, for power; 4" Drummond S.C. Lathe; 7½" B.G. S.S. and S.C. Lathe, cabinet leg, with countershaft.—Below.

4½" Patrick Capstan Lathe, nearly new; Model-maker's Milling Machine; Tuttery Treadle and Power Fretsaw Machine; Pipe-maker's Lathes; various Lathe Headstocks. State requirements, please.—KNAPTON'S MACHINERY MART, Wade Lane, Leeds.

Lathe (Patrick), 6" gap, B.G., S.C., automatic cross-feed, universal slide-rest, flat pulleys, countershaft, new, £20.—493, Norwood Road, S.E.27.

New Bench Screwing Machine to 5/16", 30s., Dividing Heads, 3½" centres, 40s.—Particulars, 10, Tennyson Street, Keighley.

Chuck, new, 12", 4-jaw independent hardened steel jaws, Cushman type, £5; Double-ended Grinder, heavy type, as new, £3 10s.; 2 Double Seaming Machines for tin canister making, £15.—TAYLOR, 8, Avenue Road, Bow, London, E.

Engines

"Lion" Oil and Petrol Engines, complete outfits, from £12; British made; deferred terms.—LION ENGINE CO., 166a, Pentonville Road, N.1.

The "Hartop" Improved "A.V." Type Four-stroke Water-cooled Engine is fitted with skew gears and weighs 1¼ cwt. unpacked. It is 3" bore by 4" stroke, and develops 1—1½ h.-p. Price, finished, complete with accessories, £6 10s.—Below.

Our New "F.E." Type Vertical Two-stroke Engine is 2¾" bore by 3" stroke, and develops 1½ h.-p. Price, complete with accessories, £8 8s. Interesting lists of this and other Engines and Sets post free.—FRANK HARTOP & SONS, Engineers, 28, St. Leonard's Avenue, Bedford.

Crossley Gas Engine, complete, first-class condition, diameter cylinder 5"×9" stroke, £6.—DYSONS, Peterborough.

8 h.-p. National Petrol Engine, horizontal, magneto ignition, complete with tank and all accessories; 100-volt 40-amp. Dynamo and switchboard: complete plant now running 10 hours a day battery charging; inspection invited; for sale £50; another, same type, but 220 volts 20 amps., £60; seen running.—Below.

14 h.-p. Standard Engine, good as new, date 1924, complete, £10; 12 h.-p. Belsize Engine and Gear-box, one unit, complete, £10.—SASS, Motor Engineer, Brigg, Lincs.

5 h.-p. National Gas Engine, magneto ignition, £9; 4 h.-p. Wilson Oil Engine, £9.—136, London Road, Mitcham.

1½ h.-p. Petrol-Paraffin Engine, governed, heavy horizontal design, H.T. magneto, £8; 10-volt 8-amp. Charging Dynamo, enclosed, perfect, 35s.; 6-volt 120-amp. Accumulator, perfect, 25s. 6d.; Auto. Cut-out, mercury break, 12s. 6d.—WOODMAN, South Muskham, Newark.

Universal Bargains. Here's Remarkable Value.—Brand new Two-stroke Precision Petrol Engine, 2—2½ h.-p., with fan for cooling, and fitted with brand new enclosed waterproof magneto, carburettor, fuel tank and silencer, together with thoroughly modern totally-enclosed ball-bearing type shunt-wound dynamo, 10 amps., lighting 12 to 14 H.W. lamps of 16 candle-power each, comfortably; the above machines are absolutely perfect, and are sold for no fault whatever; very rare bargain indeed; £7 10s. 6d.; "wire" secures; considering these two machines cost close on £30, surely it is giving them away at £7 10s. 6d.; packed free, and carriage paid to your address.—UNIVERSAL MOTORS, James' Road, Derby.

Stationary Petrol Engine, 2 h.-p., 4-stroke, shafting, pulleys, £8.—WILSON, 8, Bloomfield Road, Kingston, Surrey.

5 h.-p. National Gas Engine, No. 11464, 2 fly-wheels, pulley, exhaust silencer, gas-bag, tank, and all accessories, £9.—C. DALTON, Thurgarton, Notts.

2½ h.-p. Horizontal Amanco Gas Engine, complete, £8 10s.—BROWN, 103, Norroy Road, Putney, S.W.15.

Stuart Petrol Engine, ¼ h.-p., water cooled, tanks, coil and battery, £2; Triumph Cycle Engine, magneto and carburettor, no valves, good condition, 15s.—BEVIS, Linford, Stanford-le-Hope, Essex.

"Engines"—*(Contd.)*

3½ h.-p. Brand New Side-valve Air-cooled J.A.P., single cylinder, complete M.L. magneto, £8 10s.—ACE ENGINEERING, 20, Bucklersbury, London, E.C.4.

Gas or Petrol Engine, 2¾" bore, 4" stroke, 2 heavy flywheels, skew gears, plug ignition, bore perfect, sacrifice, first cash £2; 6½" Heavy-type Headstock, 4 speeds, tapered bronze bearings, with poppet head, 25s.; gift. Wanted, 4½" Heavy-type Three-point Steady, hinged type.—V. BEAUMONT, 62, Long Lane, Dalton, Huddersfield.

Four-cylinder Car Engines, suitable for driving dynamos, etc., at bargain prices. Overland, £5; Darracq, £3 10s.; Sunbeam, £8. Send for particulars.—McHUDSON, 75, Barrack Road, Leeds.

1 h.-p. Vertical Petrol Engine, complete with magneto, carburettor, tank, etc., fully guaranteed, suit small workshop, 40s.—Below.

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3 h.-p. Vertical Petrol Engine, coil ignition, been run on gas, splendid compression, 25s.—Below.

1½ h.-p. Horizontal Petrol Engine, complete with magneto, carburettor, tank, etc., had little use, genuine bargain, 40s.—Below.

Latest Type Smith's 6-volt Light Car Dynamo, 30s.; 12-volt C.A.V.'s, 30s.; 200 candle Kitson Paraffin Incandescent Lamp, 14s.; Ford Coils, 3s. 6d.; fine old Skeleton Clock, working order, 14s.; ½-plate Lancaster Stand Camera, complete, guaranteed, 14s.; appointment.—22, Caddington Road, Cricklewood, N.W.2.

Horizontal Petrol Engine, 1½ h.-p., good order, drive lathe, 38s.—CECIL PEIRCE, 37, Dinapore Street, Brighton.

Steam Mill Engine, 1½" bore by 3½" stroke, 8" flywheel, slide valve, with overhead valve chamber, adjustable bearings, correct design, engineer made, perfect condition and working order; extremely powerful, with only 30 lb. steam; complete, 27s. 6d.; gift.—" Lido," Ridgeview Road, N.20.

4½ h.-p. Hornsby Late-type Horizontal Gas Engine, fine condition; 4½ h.-p. National Horizontal Gas Engine, late type; also many others in small powers.—Below.

Various Small Gas, Oil and Steam Engines, in small sizes; Boilers, etc. State requirements, please.—KNAPTON'S MACHINERY MART, Wade Lane Leeds.

Read "Electricity" every week. A clearly written, well illustrated, practical trade paper. Every Thursday, 3d. Newsagents and Bookstalls.

Dynamos for workshop lighting or battery charging, latest type Marston-Elkington make, 6 or 12 volts, slow running, brand new and guaranteed, 70s. each (list price £10 10s.). One month's approval allowed. Send for illustrations.—MAUDE'S, below.

Accumulators (Peto & Radford): 2 volts 60 amps., 8s. 6d.; 2 volts 80 amps., 10s. 9d.; Fuller, 6 volts 40 amps., 17s. 6d.; "Block" type, 18s. 9d.; C.A.V., 6 volts 60 amps., 25s.—Below.

Storage Batteries, C.A.V., 6 volts 88 amps. (actual), 45s. each. All new, and sent on approval against cash.—MAUDE RUBBER CO., LTD., 58, Praed Street, W.

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Charging and Demonstrating Switchboard, 1" slate, 4 ft. 2" × 1 ft. 8", on iron frame, with extra ½" panel, 2 ft. 8" × 1 ft. 8", fitted three voltmeters (one moving coil) and three ammeters, reversing collecting switch, 3 D.P. switches, bus bars and automatic cut-out, with clock mount, as fitted in the *M.E.* workshop; connected thereto a 20-volt 40-amp.-hour Chloride Accumulator Battery, in glass-covered stand, with glass cells. (wants new negatives); price £6 10s.—GENTRY, 66, Farringdon Street, London, E.C.4.

D.C. Motors and Dynamos.—1/17th h.-p. 200—250-volt Motor, £1 15s.; ½ h.-p., 100—110-volt Crocker-Wheeler, no starter, £3 10s.; carriage extra.—GENTRY, 66, Farringdon Street, E.C.4.

Accumulators, glass, suitable small installations: Accumulator Plates, single, groups, containers, separators.—HAYNES, rear 847, Old Kent Road, S.E.15.

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50/60-volt 12-amp. Charging Dynamos, ring-oiling bearings, as new, £5 10s. each.—Below.

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A.C. and D.C. Motors, from 1 h.-p. upwards, perfect and cheap; all goods offered are guaranteed.—COLE, Milo Works, Milo Road, East Dulwich, S.E.22.

First-class Lighting Set, vertical 2-stroke, magneto, all roller bearings, governed, 35-volt 10-amp. dynamo, complete switchboard, tanks, 28-volt set of batteries, £15.—BRYANT, Peasey Hill, Malton, Yorks.

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Microphone Transformers, 100: 1 ratio, specially designed to ensure best possible results in using radio headphones, loud-speaker or valve amplifier with sensitive microphone, 4s. 6d.; primary and secondary terminals fitted; diagrams of connections free; goods posted by return.—FELLOS, ADOLPH, 34, Fitzroy Street, London, W.1.

Transformers, 220 to 110 volts, 220 to 50, 220 to 25, 30s.—Below.

Motors, ¾ h.-p., 220, 440 volts, 50 cycles, single phase, New Century, £15; 2 h.-p., 220 volts, £8; 1 h.-p., 230 volts, £5.—Below.

Dynamo, 50 volts 20 amps., shunt, ball bearings, 4-pole, carbon brushes, charging and lighting, Lyon & Wrench, £7.—Below.

Amp. Meter, 4" dials, 0 to 10, 20s.—493, Norwood Road, S.E.27.

Wonderful! Wonderful!—Magnificent totally-enclosed Modern High-class Shunt-wound Ball-bearing type Dynamo, right for lighting and charging, giving an output of 12 to 16 volts approx. 10 amps., and lighting comfortably 12 H.W. 16 candle-power lamps, fitted with pulley and slide rails. We have only a few of these excellent generators left for disposal, so order early if you wish one reserved. £1 15s. Every machine guaranteed.—UNIVERSAL MOTORS, James' Road, Derby.

½ h.-p. 200- or 230-volt Single-phase Motors, with start and running switch, brand new, £4 5s., carriage paid. Various small Dynamos and Motors in A.C. and D.C. types. State requirements, please.—KNAPTON'S MACHINERY MART, Wade Lane, Leeds.

110-volt 50-amp. Dynamo, £10; 50-volt 20-amp. Petrol Electric Unit, £12.—136, London Road, Mitcham.

6-volt Accumulator, as new, bargain 20s.; cost double.—G. WOOD, Woodbine House, Dalbeattie.

30-volt 10-amp. Dynamo, £3; 2 h.-p. 220-volt D.C. Motor and Starter, £5; 350 MODEL ENGINEER, £1.—RAWLINS, 137, Blenheim Crescent, W.11.

C.A.V. Charging Dynamo for sale, 30 volts 10 amps., as new, £3 10s.—KEABLE, 30, Buxton Road, Thornton Heath.

Charging Dynamo, 12/16 volts 10 amps., ball bearings, carbon brushes, pulley and slide rails, perfect condition, cost £7, bargain 35s.; Auto. Cut-in and Cut-out, 12 volts 10 amps., cost 25s., bargain 10s.—B. O. PRIESTLEY, 46, Glasslyn Road, Crouch End, London, N.8.

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(Continued on page iv.)

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